GEOLOGY
and
WATER RESOURCES
of
KLICKITAT COUNTY

Water Supply Bulletin No. 50

August 1979

STATE OF WASHINGTON
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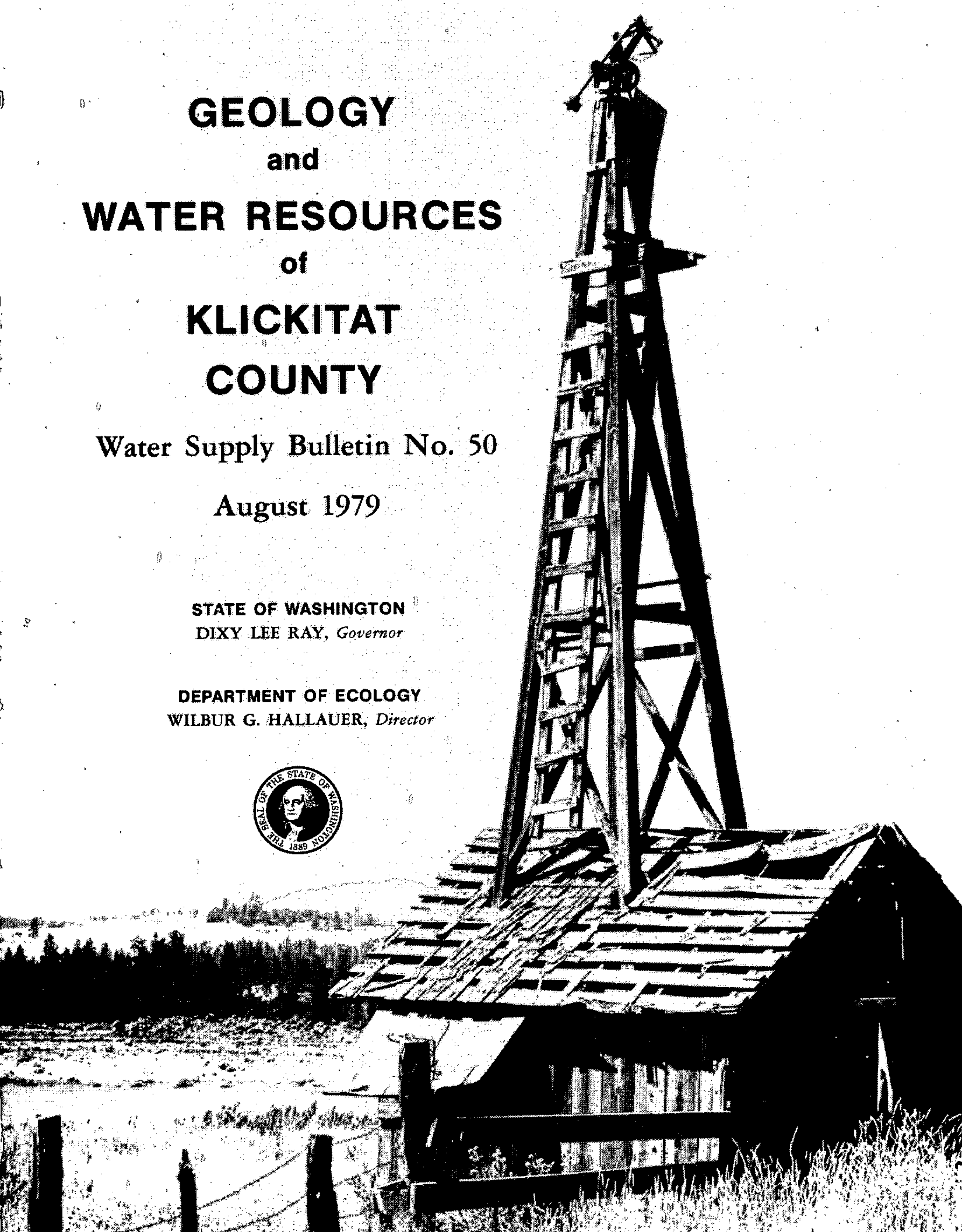

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When the well's dry, we know the worth of water.

Poor Richard's Almanac
(1746)

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ABSTRACT

The area investigated in this report encompasses about 2200 square miles including all of Klickitat County and that part of the Klickitat River basin north of the county. The study area lies just north of the Columbia River in south-central Washington and is bordered by the Cascade Mountains on the west. Elevations range from 72 feet in the southwest to 12,307 foot Mt. Adams in the northwest. Much of the area has rugged topography produced by deep canyons dissecting high plateau surfaces.

Climatic conditions within the county are normally cool and wet in the winter and warm and dry in the summer. Precipitation is greatest in the western edge of the county, and in the high elevations, reaching in excess of 100 inches per year on Mt. Adams. Precipitation decreases to less than 10 inches per year in the eastern part of the county. Unequal distribution of precipitation produces dense vegetation and conifer forests in the west which gradually change to sagebrush and sparse vegetation to the east. Substantial elevation differences that exist between plateau surfaces and valley bottoms also produce climatic and vegetational differences throughout the county.

Major geologic units are volcanics and interbedded sediments which range in age from Tertiary to Recent. The oldest rocks exposed, found in the extreme western part of the county, are tuffs and tuff breccias interbedded with lesser amounts of basaltic and andesitic lavas and may be equivalent to part of the Ohanapecosh Formation. Overlying these older volcanics are basalts of the Columbia River Basalt Group. These basalts are the principal unit exposed in the county and thicken from west to east.

In northern and western parts of the county, the Columbia River Basalt is overlain by both sediments and younger volcanics. The sediments include

quartizitic and andesitic conglomerates. The volcanics consist of basaltic and andesitic lavas of the Simcoe Mountains and young andesites from Mt. Adams and other eruptive centers in northwestern Klickitat County. On Camas Prairie, recent gravels of glacial and/or glaciofluvial origin overly the younger volcanics.

The geologic units are involved in a series of structures which decrease in magnitude and frequency from west to east. The structures are categorized in two groups: 1) primary east-west structures which are large amplitude folds running almost the entire length of the county, 2) secondary northwest-southeast trending structures which are a series of smaller folds superimposed on the primary structures. Deformation appears to have begun in the Pliocene and continued sporadically to Recent time.

Distribution of the county's surface-water resources is directly related to distribution of precipitation with the resource being abundant in the west and virtually absent in the east. Analysis of stream gaging data indicates streams in the west have uniform discharge throughout the year with minimum flows sustained by ice and snowmelt. In contrast, streams in the east are intermittent and exhibit the instantaneous effects associated with arid or semiarid conditions. Streams in the central part of the county represent a transition between the two extremes having high discharge during runoff months but very low minimum flows during dry months. Topographic and climatic conditions are favorable for flooding and major flooding has occurred as recently as 1974. Most of the damaging flooding has occurred in the Klickitat and Little Klickitat River basins.

Ground-water supplies within the county appear adequate with most ground-water obtained from wells in the basalts of the Columbia River Group. The extensive distribution of the basalt flows and the presence of highly

permeable interflow zones facilitate development of this ground-water resource. Well production varies from a few gpm to as much as 500 to 1000 gpm in irrigation wells. Some irrigation wells drilled in the extreme eastern part of the county yield 2000 to 3000 gpm.

In the northern and western part of the county, some domestic supplies are obtained from unconsolidated sediments and younger volcanics. Ground-water-supplies are barely adequate in areas such as the Goodnoe Hills where topographic and geologic factors limit available recharge.

The chemical quality of water within the study area is adequate for most uses. Surface-water quality is good with most of the examined parameters indicating a classification of AA according to the standards set by the Water Pollution Control Commission of Washington. Only total coliform exceeded the class AA limits for perennial streams in Klickitat County.

Ground water also appears to be of excellent quality. In most cases ground water tested has concentration of chemical constituents well below those allowed for public water supplies. In a few areas, iron content appears abnormally high and water drawn from sediments or basalts overlain by thick sediments, will often have high hardness. Isolated occurrences of wells and springs with very high chemical content exist in the Klickitat River valley.

Most registered claims for surface water are located in the western third of the county where surface supplies are most abundant. Many of the claims date back to the late 1800's and reflect the initial dependence upon surface-water supplies. Currently, 594 claims for a total of 568.55 cfs of surface water exist.

Claims for ground water predominate in the central and eastern part of the county and most of the demand for ground water has occurred since 1950.

Development of deep well irrigation in the Goldendale-Centerville area and extreme eastern Klickitat County has led to substantial increase in ground-water use. Review of water rights indicate 401 claims for a total of 157,913.5 gallons per minute are presently recorded. A notable increase in claims for both surface and ground water is present from 1965 to 1975 and may be in part because of the Water Right Claim Registration Act. Currently, surface-water supplies are near fully appropriated and ground-water supplies appear to keep pace with demand. The ability of ground-water supplies to support further demand is unknown. Areas within the county in which potential problems could develop include the Bickleton area, Dead Canyon and Alder Creek basins, and the Goldendale-Centerville area.

INTRODUCTION

This study of Klickitat County and the upper Klickitat drainage area was done at the request of the Washington State Department of Ecology by the Geohydrology Section, College of Engineering, Washington State University. The study is part of a continuing effort by the Department of Ecology to inventory the state's water resources on a regional basis. Such an inventory will facilitate the understanding and subsequent management of the state's valuable water resources.

Purpose and Scope

In the past 30 years, development of Washington's water resources has rapidly intensified. Increased demand for domestic, municipal, industrial, and agricultural purposes and an improved water production technology have resulted in a dramatic increase in the use of both surface- and ground-water supplies. Concern over long-range effects of this increased use has led to the development of a water resource management program. The ultimate goal of such a program is to assure adequate supplies of the resource in the future. Development of a realistic management program for any area depends upon a thorough understanding of the area's water resources and the factors which affect their distribution and occurrence. This report is designed to present basic information necessary to such an understanding for Klickitat County and the upper Klickitat River basin.

The study combines existing data on meterology, geology, surface and ground water, and water quality, with additional information obtained through field work. Work commenced on the study in January 1975 with most data collection being completed by March 1977. Field work was accomplished during 1975 and 1976. The study is reconnaissance in nature and presents basic information for water resource research, management, and use.

Location and Extent

The area of study is located in the southernmost part of Washington State (Figure 1) and includes all of Klickitat County and the part of the

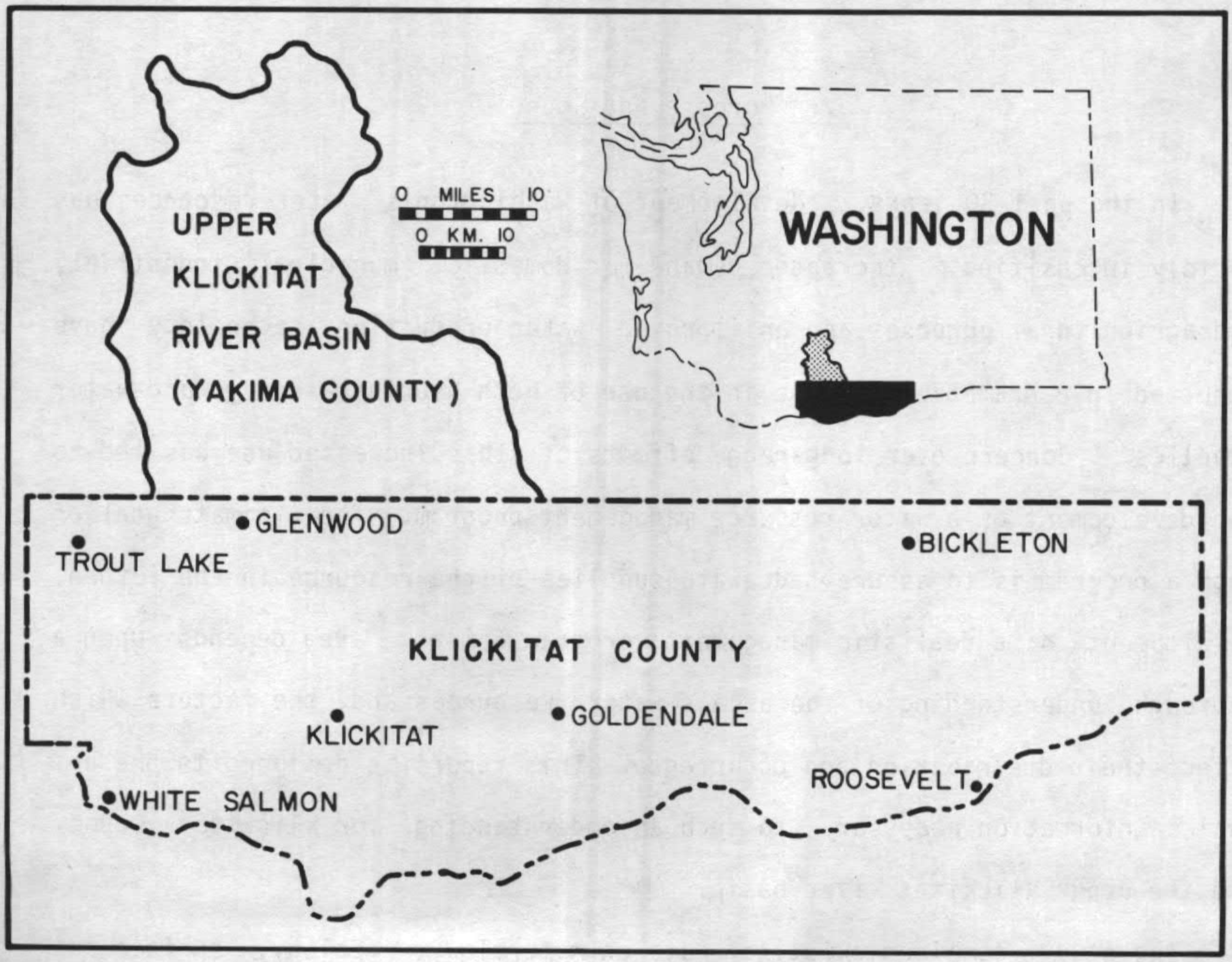

FIGURE 1. Location of investigated area, Klickitat County and the upper Klickitat River basin, Washington.

Klickitat River basin extending north into western Yakima County. Klickitat County has an area of about 1800 square miles and includes parts of Townships 2 through 6 North of the Willamette Base Line and Ranges 10 through 23 East of the Willamette Meridian. The upper Klickitat basin lies north of the county and includes an area in excess of 400 square miles in parts of Townships 7 through 12 North and Ranges 11 through 16 East.

Previous Work

Previous studies in the Klickitat County area have dealt primarily with geology in the immediate area of the Columbia River gorge. Earliest work by Russell (1892) included parts of Klickitat County in a reconnaissance of central Washington. Later, Waring (1913) studied eastern Klickitat County in a general geologic and water resource investigation of south-central Washington.

Williams (1916) initially described much of the Columbia River gorge structure with subsequent work done by Hodge (1931), Piper (1932), and Newcomb (1967, 1969). Bretz (1917) investigated sedimentary deposits in the gorge. Work on the origin and nature of these deposits was continued by Buwalda and Moore (1930), Warren (1941a, 1941b), Waters (1955), and Newcomb (1966, 1969).

Definition of geology and geologic structures elsewhere in the county includes work by Sheppard (1960), who studied in the Simcoe Mountains and later (1967) produced a map of the area. Sheppard (1964) also produced a geologic map of the Husum Quadrangle in western Klickitat County. Other geologic investigation of the western part of the county consists mainly of reconnaissance mapping by Hammond (1973).

Research by Laval (1956) and Schmincke (1964) and later work by Newcomb (1971) provide information on stratigraphy and structure of parts of eastern Klickitat County. In addition, geologic reconnaissance done by Shannon and Wilson, Inc. (1973, 1974) includes much of the eastern half of the county. General geologic information for the entire study area is presented in maps by Huntting and others (1961) and by Newcomb (1970).

Analyses of water resources of the Klickitat County area are sparse. Discussion of the area's surface-water resources are virtually nonexistent, although information on surface-water resources of the upper Klickitat River basin is presented by Cline (1976). Information on floods, primarily in the Klickitat River basin, was developed by Longfield (1974) and Cline (1976).

Early reconnaissance work by Waring (1913) and Piper (1932) provide some information on ground-water resources in eastern and southern Klickitat County. Studies by Newcomb (1969) and Luzier (1969) provide a more recent ground-water resource evaluation of the Columbia River gorge and the Goldendale-Centerville areas. Work by Newcomb (1971) and Crosby and others (1972) provide additional information on ground-water resources in eastern Klickitat County. Ground-water resources in the Glenwood area of western Klickitat County were examined by Cline in 1976.

Acknowledgements

This study was a team effort, and many people deserve recognition for their contributions.

Lynne Covell, Krystyna Kowalik, Mike Robinette, Steven Strait, Kevin Sylvester, and Tom Weber assisted in data collection assembly. Carol Bohringer, Jaydee McCrackin, Cathy Naugle, Rick Ward, and Diane Weber were instrumental in manuscript preparation. James W. Crosby, III, critically edited the manuscript.

The Washington State Department of Ecology and the U. S. Geological Survey provided much of the data on ground- and surface-water resources and water use. Special thanks are due to Peder Grimstad of the Department of Ecology for his patience and to Denzel Cline and Rod Williams of the U. S. Geological Survey for their assistance in providing much valuable data.

Conversation and field observation with Paul Hammond, Portland State University, Robert Bentley, Central Washington University, and Don Swanson, U. S. Geological Survey, were helpful in understanding geological problems.

Ken O'Leary of O'Leary Drilling and Dick Murray of Murray Well Drilling provided valuable information on subsurface conditions and ground-water occurrence within the county. In addition, assistance from personnel of the Soil Conservation Service, Washington State Department of Natural Resources, Klickitat County Regional Planning Council, Klickitat County Public Utility District, Portland General Electric Company, Pacific Power and Light Company, Shannon and Wilson, Inc., and Martin-Marietta Corporation is gratefully acknowledged.

Finally, special thanks are extended to the good people of Klickitat County who graciously allowed access to land and wells and provided much valuable information.

CHARACTERISTICS OF THE REGION

The study area is bordered on the west by the Cascade Mountains and occupies a transition zone between the mountains and the Columbia Plateau to the east. Most of the county occupies a southward-sloping surface which extends from the Horse Heaven Hills, near the county's northern border, to the Columbia Hills in the south.

The Columbia River lies along the southern margin of the county and, because of geologic structure and erosion, it occupies a canyon much lower in elevation than other areas of the county. The elevation of the Columbia River in this reach varies from 72 feet above MSL at the western county line to 265 feet. As a result of these elevation differences, streams draining interior parts of the county have carved deep north-south canyons. These deeply incised streams have produced substantial topographic relief throughout the county and have created a series of high, plateau-like surfaces separated by deep, narrow canyons.

The upper Klickitat River basin is an area of extremely rugged topography. Elevations in much of the area are higher than 3000 feet, with the highest point being Mt. Adams (12,307 ft). The relatively low base level of the Klickitat River has resulted in deep cutting by tributaries in the upper basin and has produced the very steep, rugged topography characteristic of the area.

Climate

Klickitat County occupies a zone of climatic transition between the relatively moist conditions prevalent west of the Cascades and the semiarid conditions to the east. Winters are normally wet, with the western part receiving a substantially higher rainfall than the eastern part. During summer months, the county is normally warm and dry.

The county's weather is primarily controlled by the high-pressure air mass normally present in the northeast Pacific Ocean during the summer and the low-pressure air mass that normally occupies the Gulf of Alaska in winter. To a lesser extent, two geological factors, the Cascade Mountains and variation of elevation within the county also affect the weather.

During summer months, the high-pressure air mass usually dominates weather, sending air into the area from the west. Since the ocean is nearly constant in temperature throughout the year, air flowing in from the ocean during the summer months is cooler than the land. The air warms as it moves inland, which results in warm, dry summers. East of the Cascades the lack of the ocean's direct moderating effect results in even warmer and drier conditions that are present to the west.

In winter the decrease in solar radiation causes a weakening of the high-pressure system, and it gradually migrates southward. Concomitant with the weakening of this system, the low-pressure system in the Gulf of Alaska expands, exerting a greater influence and causing the systems to drift eastward over the continent. Counterclockwise movement of the air around these low-pressure cells normally produces a flow of air from the west and southwest. Relative to the land temperatures, the air mass is warm and moist. When this air reaches the land, it cools and condenses, producing abundant precipitation during the period from October to March. As the moist air is forced upward by the Cascades, additional precipitation occurs either as rain or snow. In the lee of the Cascades, the air mass moves to lower elevations, is warmed, and the process is reversed. Thus, a dramatic difference in precipitation is evident between the east and west sides of the Cascade Mountains. This change in precipitation resulting from the presence of the mountain is referred to as an orographic or rain-shadow effect.

Basic Data

Figure 2 presents a general summary of meterological data-collection stations within Klickitat County. A total of 15 recording stations have been established in the county, but only seven are presently in operation. Both daily temperature and precipitation information are obtained at all stations except Glenwood, where only precipitation is recorded.

Most of the long-term stations have been relocated several times. Mass density survey analyses were made of the stations at Goldendale, Bickleton, and Dallesport to see if these location changes substantially affected the long-term record. Although some variation was noted, it did not appear to correlate with changes in location. For general comparison purposes, these location changes should have little effect.

Three of the seven stations were selected for analysis and comparison of general climate areas within the county. The three stations selected for comparison are located at Mt. Adams Ranger Station, at Goldendale, and at Bickleton. The station at Mt. Adams Ranger Station records climatic conditions indicative of the western part of the county, while the stations at Goldendale and Bickleton are indicative of the central and eastern parts of the county, respectively.

Precipitation

Distribution of annual precipitation within the study area is shown in Figure 3. As expected, precipitation is highest in the northern and western areas and decreases markedly to the east and south. The decreasing

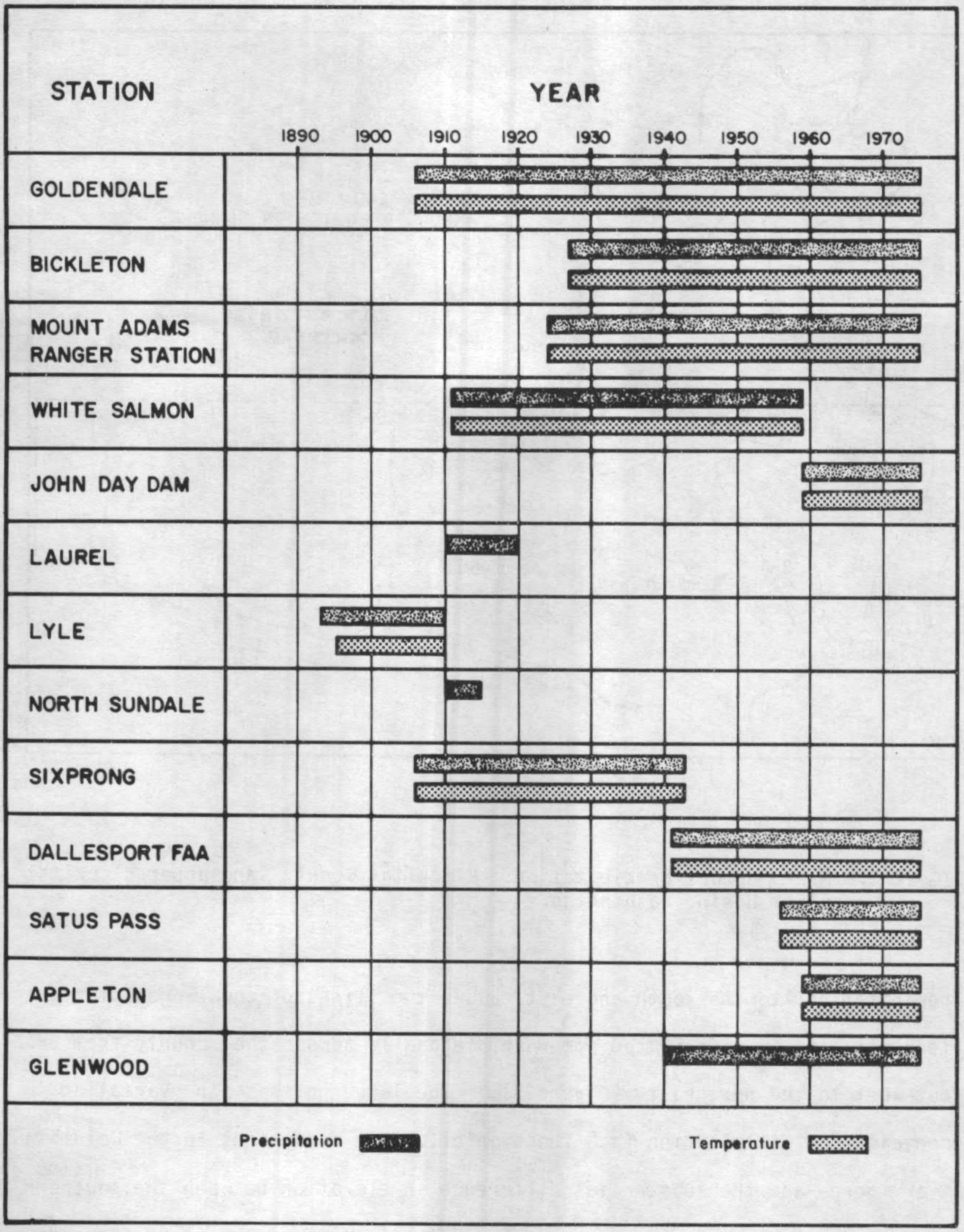

FIGURE 2. Barchart showing period of data collection for selected weather stations, Klickitat County, Washington.

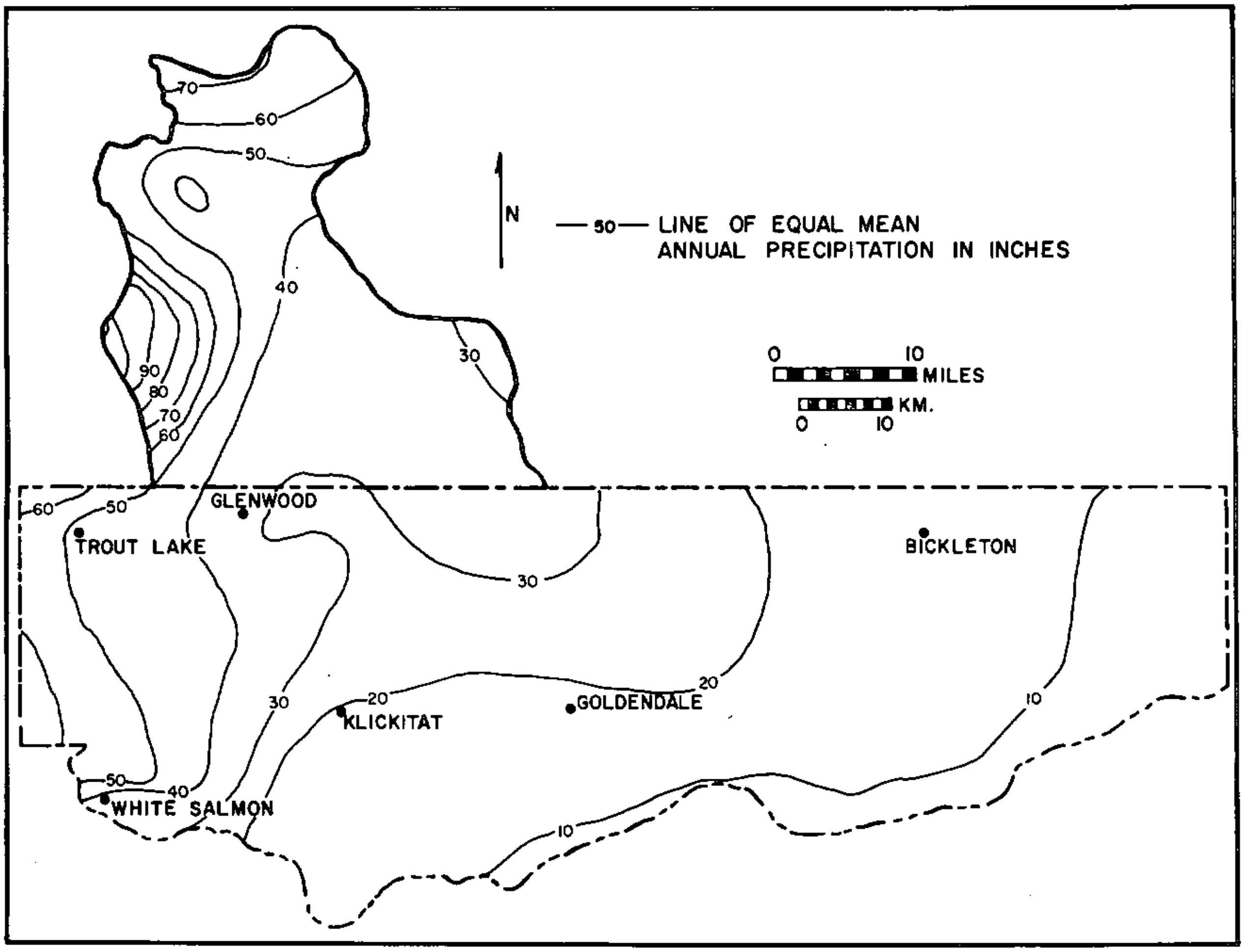

FIGURE 3. Mean annual precipitation, Klickitat County and upper Klickitat River basin, Washington.

precipitation to the south and east causes the lines of equal precipitation (isohyets) to be distributed somewhat diagonally across the county from the southwest to the northeast (Figure 3). The large north-south variation in precipitation distribution is a function of unique conditions in the Columbia River gorge and the substantial difference in elevation between the southern and northern parts of the county. The Columbia River gorge along the county's southern margin is normally warm and dry because of its low elevation and location immediately east of the water gap cut through the Cascade Mountains. The restricted area available for air flow through the gap causes compression of air on the west side, which tends to increase condensation. Once through the gap, the air is able to expand, increasing its ability to absorb moisture. The combination of warm temperature at the low elevation and the expansion of the air mass immediately east of the water gap produces extremely warm and dry conditions along the county's southern margin.

To the north, the relatively high elevation of the Horse Heaven Hills results in substantially cooler temperatures than in the gorge. Like the Cascades to the west, cooler temperatures produce greater condensation and cause annual precipitation along the Horse Heaven Hills to be greater than in areas of lower elevation immediately to the south. Because the Horse Heaven Hills extend well into eastern Klickitat County, so does this orographic effect. Thus, some of the isohyets presented in Figure 3 assume a strong northeasterly trend, extending from the Columbia River gorge in the western half of the county to the Horse Heaven Hills in the eastern half.

Comparison of monthly precipitation data for the three selected stations (Figure 4) illustrates the decrease in precipitation occurring from west to east within Klickitat County. Most of the county's precipitation occurs during the winter months with maximums at each station occurring in either December or January. Monthly minimums occur in July and August. Examination of Figure 4 reveals that, although annual precipitation varies greatly among the three stations, mean monthly precipitation for the month of July at each station is nearly equal. This similarity attests to the general distribution of the limited amount of precipitation received in the summer months within the county.

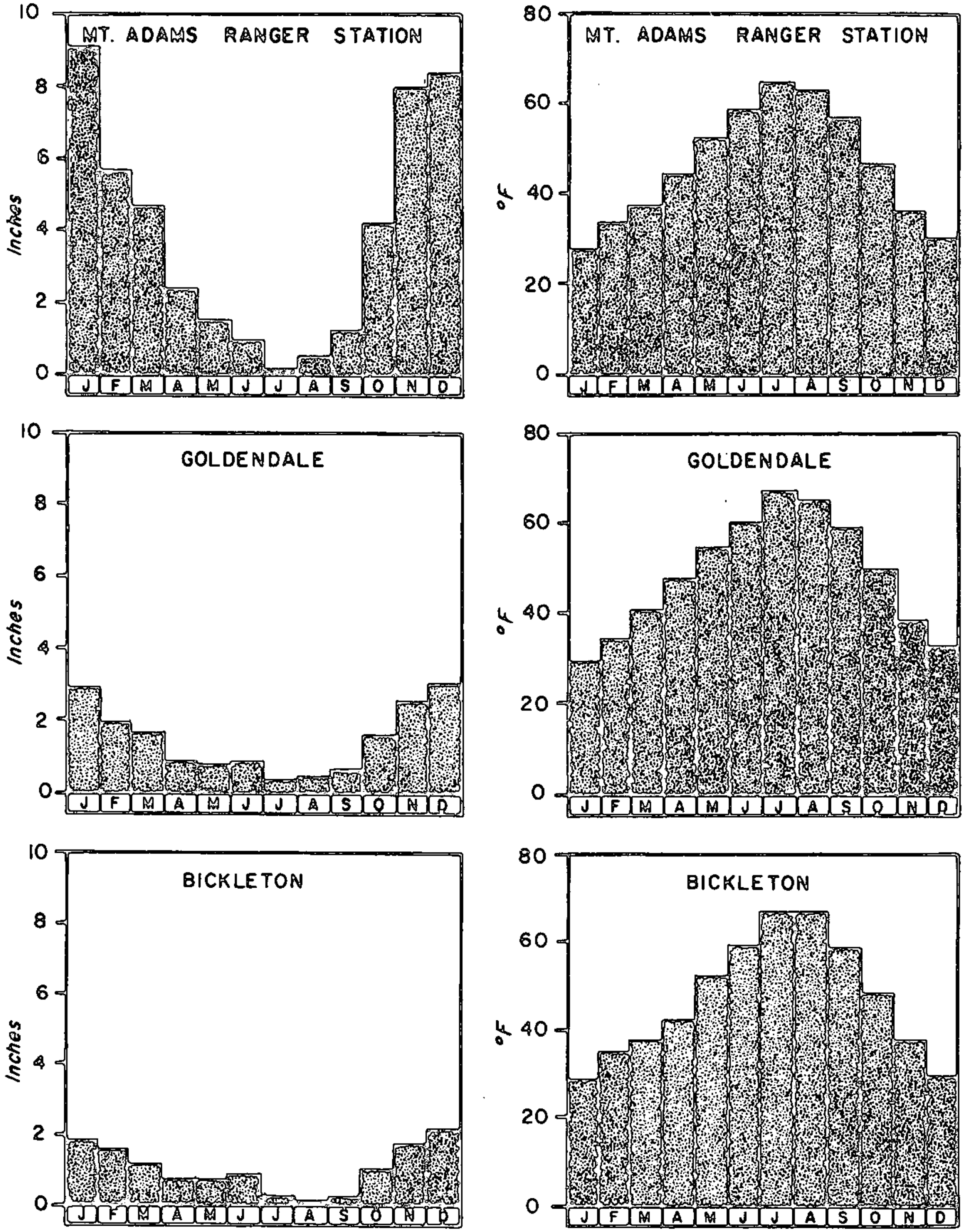

FIGURE 4. Monthly mean precipitation and temperature for stations at Mt. Adams Ranger Station, Goldendale and Bickleton, Washington.

Examination of ten-year moving averages indicates that the long-term correlation of the three stations is not as direct as might be expected. Although the same general trends can be seen in Figure 5, a close correlation does not exist. In the last five years, for example, the moving averages in the Bickleton area appear to have increased to an all-time high. A similar, though less intense, rise is noted at Mt. Adams Ranger Station. The record

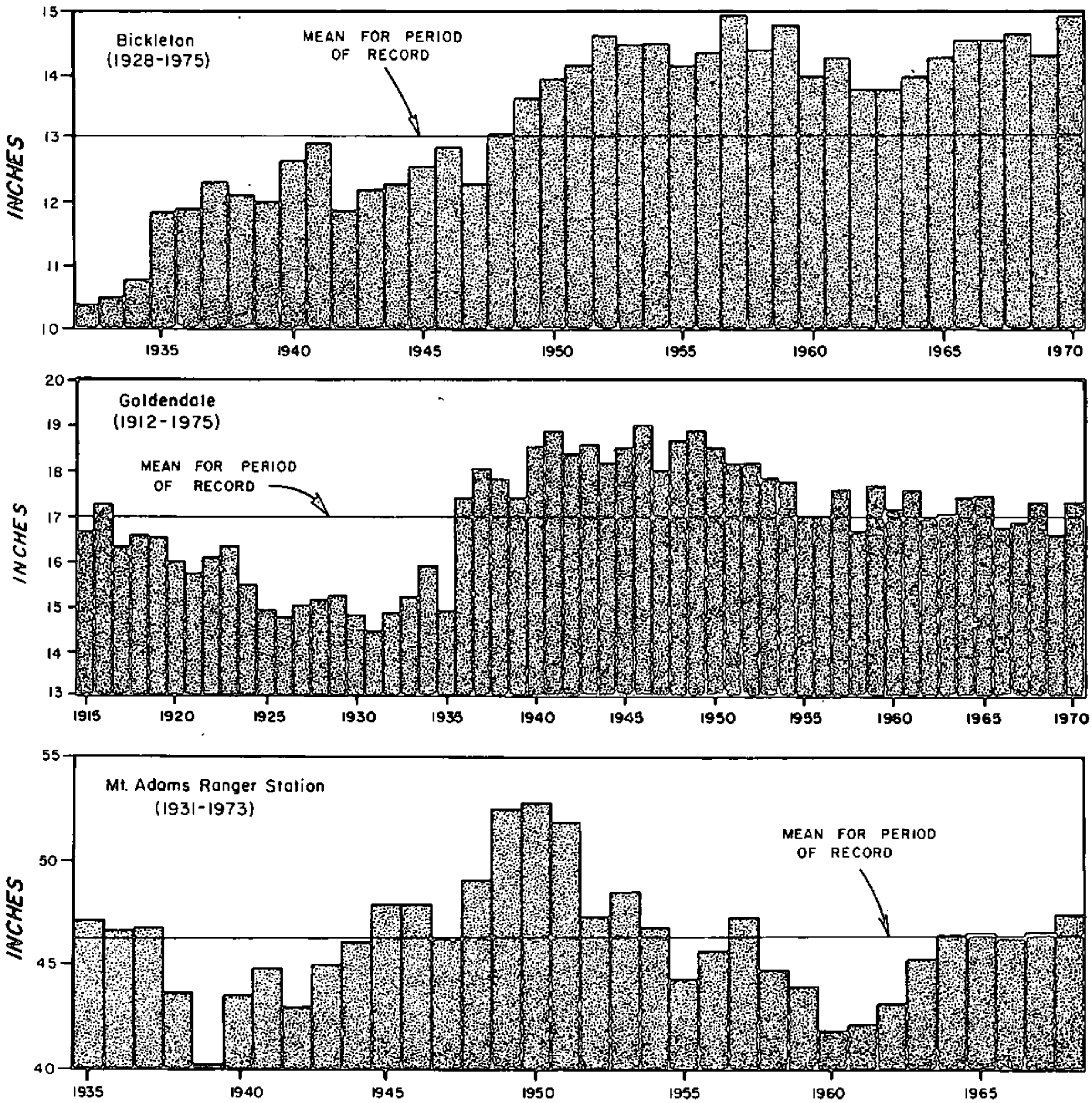

FIGURE 5. Ten-year moving average of precipitation at selected stations, Klickitat County, Washington.

for Goldendale, however, indicates little if any overall increase in the last five years. Reasons for this variation are not apparent but may be because storm movement across the county is often in a northeasterly direction rather than due east.

Moving averages reflect the periodic precipitation changes for the county. Figure 5 reveals low precipitation in the 1920's and 1930's followed by high precipitation in the 1940's. Precipitation throughout the county for the last 10 to 15 years has been about equal to the mean for the period of record, although in the Bickleton area it has been slightly higher than the mean.

Temperature

Annual temperature variation within Klickitat County reflects the changing influence of the dominant air masses and the moderating influence of the Pacific Ocean. Winter temperatures are moderate, reflecting the strong marine influence; average temperatures in January (the coldest month) are only slightly below freezing. Similarly, summer temperatures are moderate, with averages among the three stations for the month of July ranging from 65 to 70°F. The summer averages are misleading, in a sense, because the county normally experiences substantial cooling after sunset which is reflected in the averages. Thus, daytime maximum temperatures during the summer can be considerably warmer than the average.

Comparison of the three selected stations (Figure 4) reveals strikingly similar average monthly temperatures. The close similarity among the three widely separated stations at Mt. Adams Ranger Station, Goldendale, and Bickleton indicates the importance of elevation in controlling temperature. Although there is a general trend toward slightly warmer conditions from west to east within the county, this does not appear to be reflected in monthly averages, probably because the station at Bickleton is almost 1400 feet higher than that at Goldendale and 1100 feet higher than Mt. Adams Ranger Station. The effect of elevation upon temperature is also reflected in comparisons of temperature data from stations within the Columbia River gorge with those to the north. Recording stations at Dallesport and John Day Dam indicate January and July averages to be from 5 to 10°F warmer than the station at Goldendale.

Figure 6 presents the mean annual temperature for the station at Goldendale for the period of record. Examination of the figure indicates that variation in the mean temperature is less than 10°F with periods of lower-than-average temperature occurring in the early 1920's and 1930's and in the late 1940's. Higher-than-average temperatures occurred in the 1940's and in the mid-1960's.

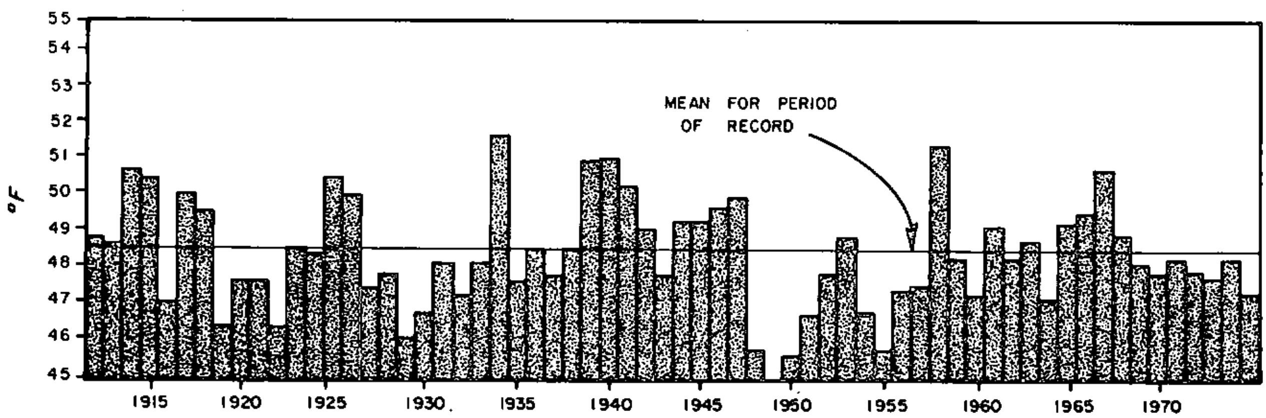

FIGURE 6. Mean annual temperature (1912-1975), Goldendale, Washington.

Water Budget

The water budget is the relationship between contribution and loss of water in a selected area. The relationship, normally presented in a water budget diagram, involves the amount of water available to an area from precipitation minus that which is lost by evaporation and transpiration from plants (evapotranspiration). The net result is an indication of the amount of water available for runoff and soil moisture recharge in the area.

Calculation of the water budget depends upon an accurate determination of water lost to evapotranspiration. A method developed by Thornthwaite and Mather (1957) is used for determination of evapotranspiration. The method is based upon the relationship between latitude and temperature, because evapotranspiration is directly related to solar insolation. As a consequence of this relationship, highest evapotranspiration normally occurs in summer.

The Thornthwaite method assumes a root zone holding capacity of 11.8 inches, which is probably excessive for most of Klickitat County. For this reason, water budget calculations presented here are most useful as an indicator of general relationships rather than as sources for reliable quantitative data.

Figures 7 through 13 present water budget diagrams for several stations throughout Klickitat County. On the diagrams, mean daily precipitation, mean daily evapotranspiration, and actual evapotranspiration are plotted. Within the county, precipitation and evapotranspiration vary inversely. For this area, evapotranspiration is lowest during high-precipitation months and highest during low-precipitation months. When precipitation is exceeded by evapotranspiration, demand for soil moisture exceeds the supply and a water deficit is created. This deficit is the difference between potential and actual evapotranspiration. The difference between actual evapotranspiration and

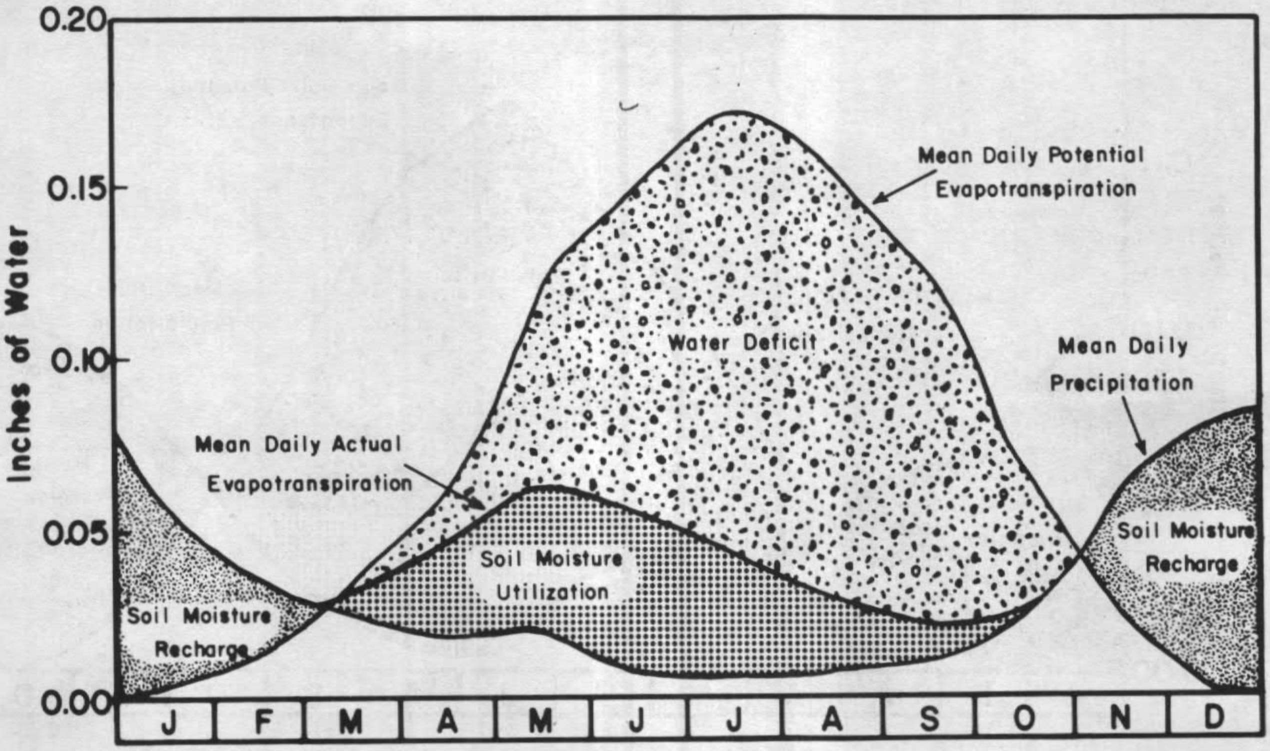

FIGURE 7. Mean annual water budget, John Day Dam, Klickitat County, Washington.

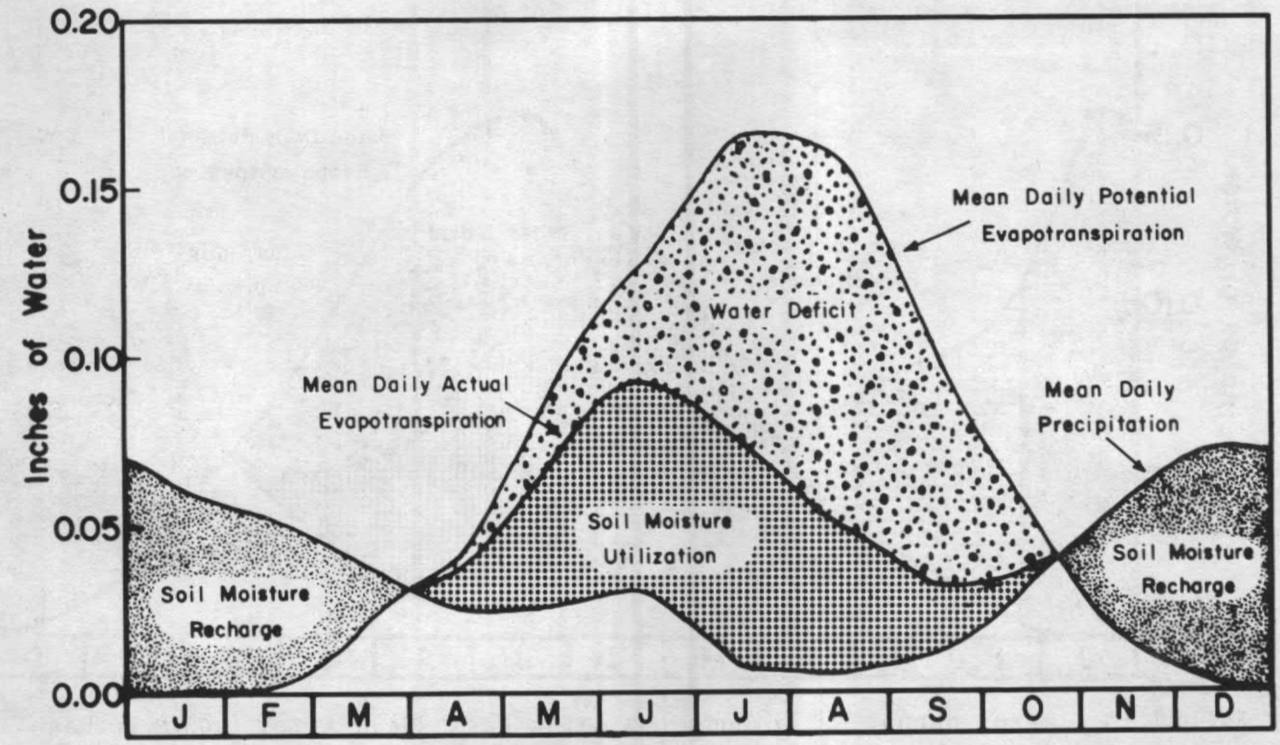

FIGURE 8. Mean annual water budget, Bickleton, Washington.

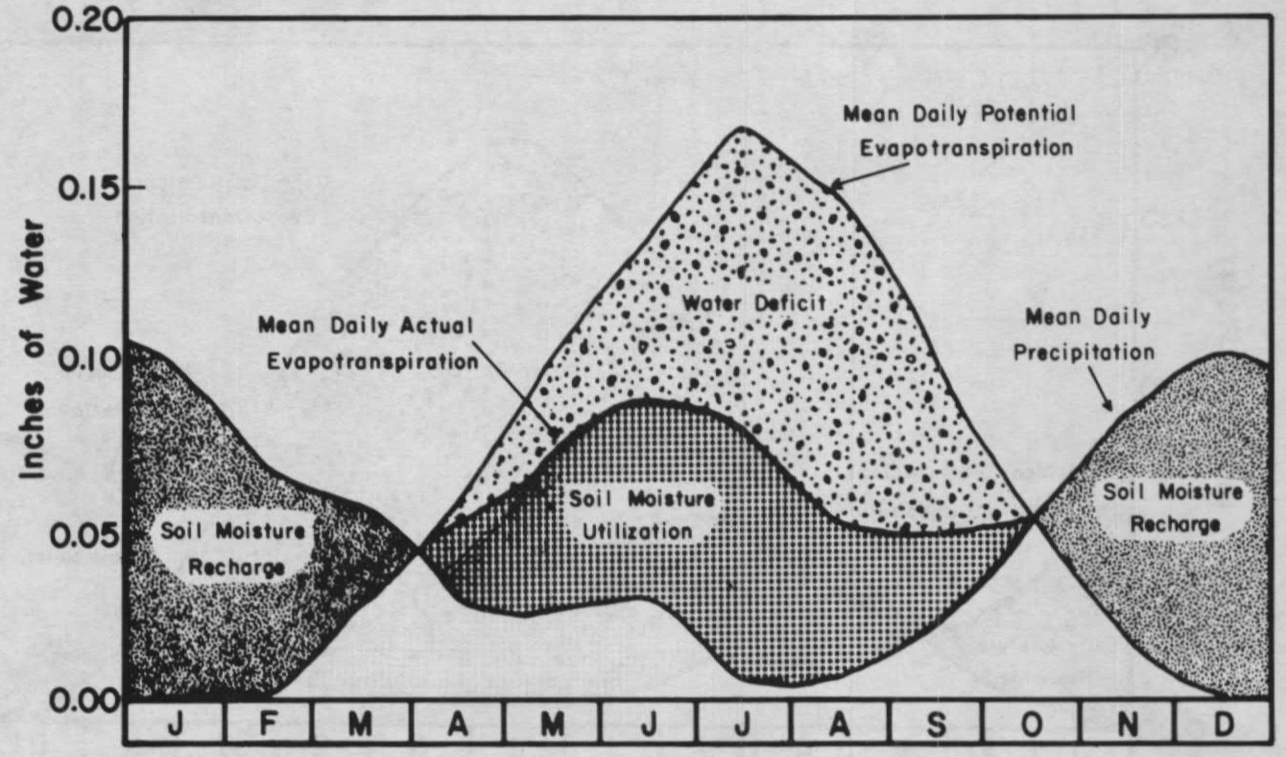

FIGURE 9. Mean annual water budget, Goldendale, Washington.

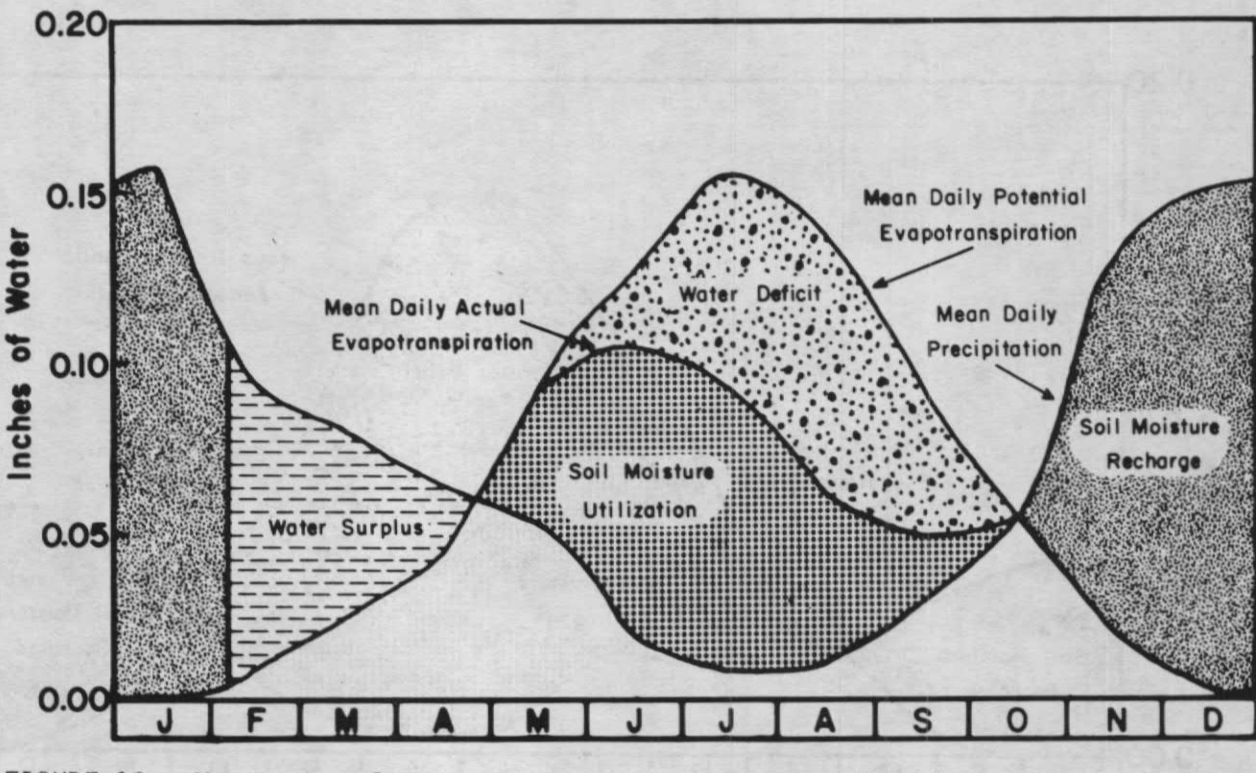

FIGURE 10. Mean annual water budget, Satus Pass, Klickitat County, Washington.

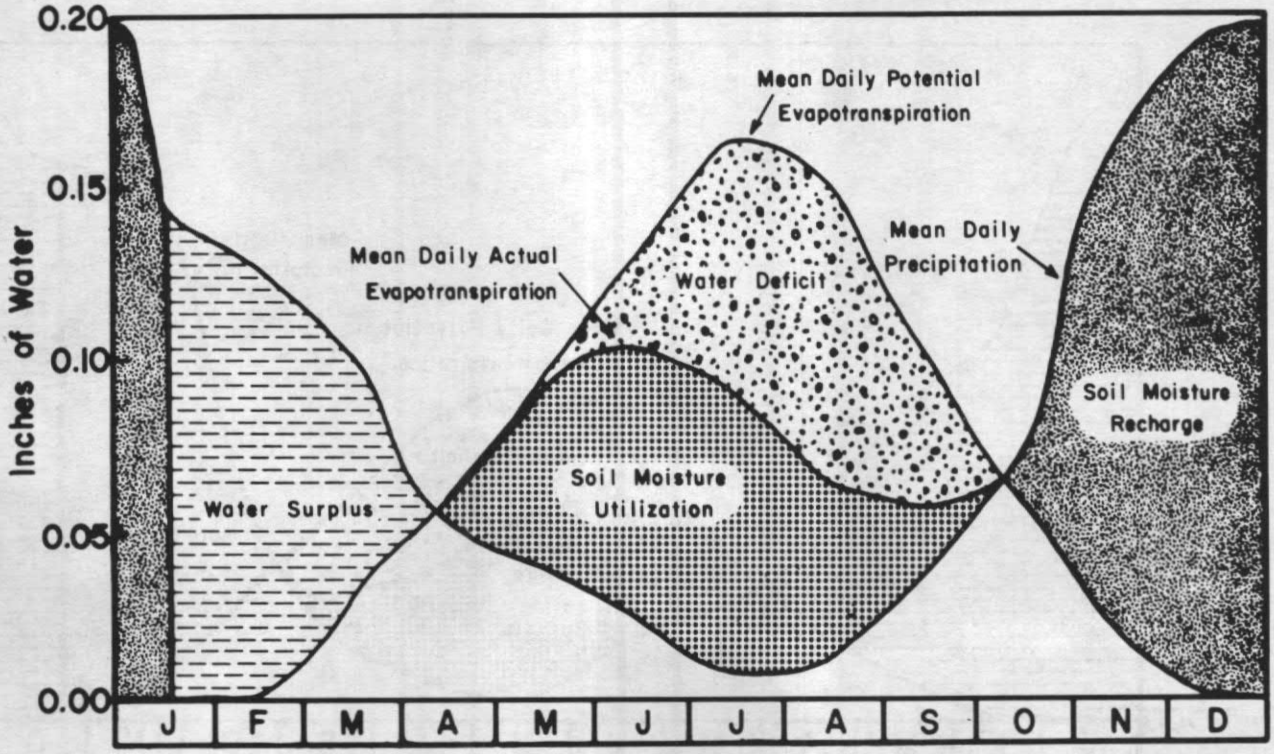

FIGURE 11. Mean annual water budget, White Salmon, Washington.

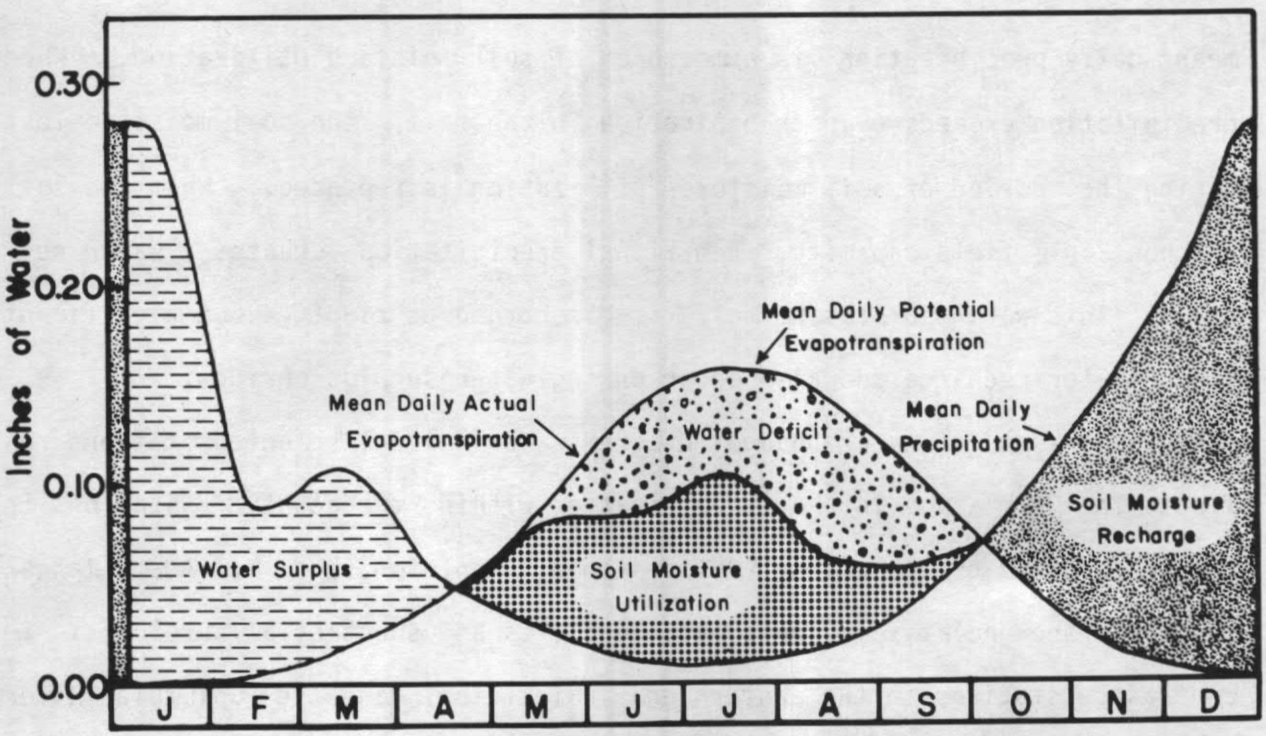

FIGURE 12. Mean annual water budget, Appleton, Washington.

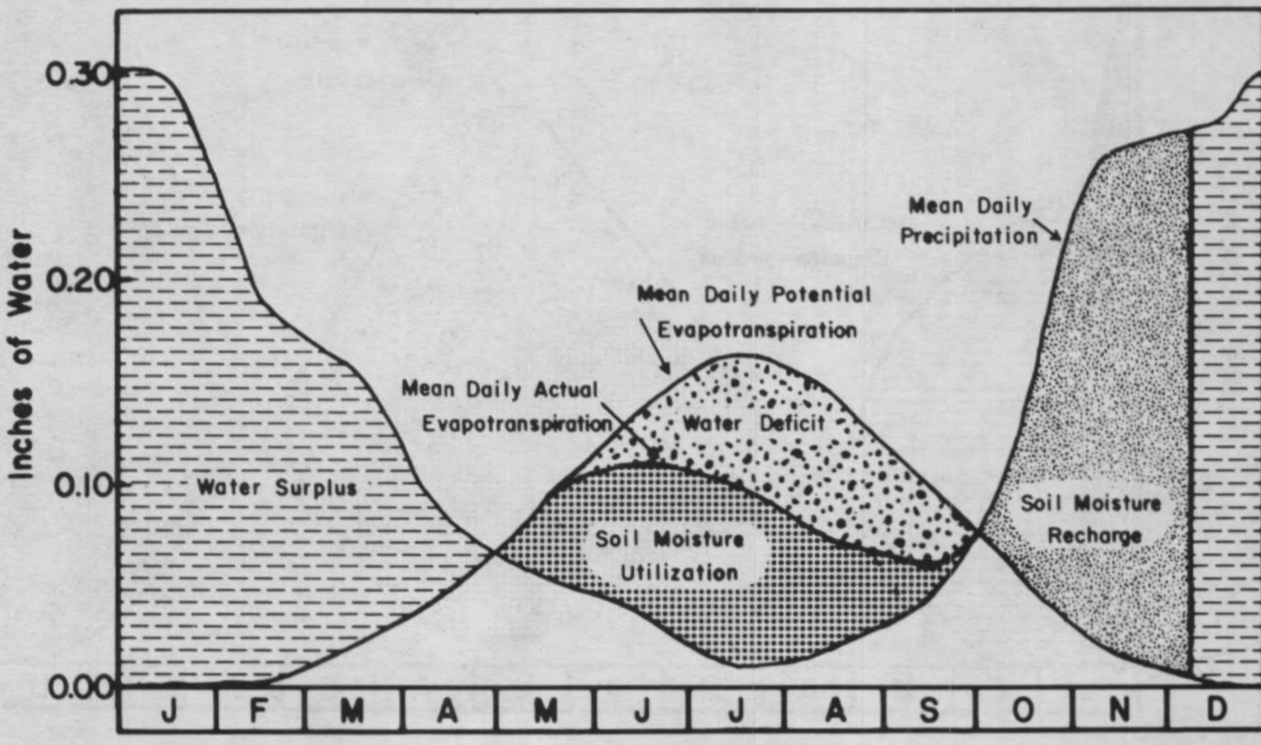

FIGURE 13. Mean annual water budget, Mt. Adams Ranger Station, Klickitat County, Washington.

mean daily precipitation is a measure of soil moisture utilization. When precipitation exceeds evapotranspiration in the fall, the soil moisture lost during the period of soil moisture utilization is replaced. When the soil reaches full field capacity, additional precipitation creates a water surplus. This water surplus normally is discharged as runoff, but significant ground-water recharge can also occur during water surplus periods.

Comparison of water budget diagrams for several selected stations reflects the variation in the precipitation within the county. Stations in the western end of the county (White Salmon, Appleton, and Mt. Adams Ranger Station) show relatively small water deficits and substantial surpluses. In contrast, stations in the eastern end (Bickleton) and the Columbia River gorge (John Day Dam) have large water deficits and no water surpluses. Comparison of the Goldendale and Satus Pass diagrams illustrate the orographic effect. Goldendale has a moderately large water deficit and no surplus, while the station at Satus Pass has a much smaller deficit and a small water surplus in the spring.

Vegetation

Klickitat County exhibits remarkable contrast from west to east because of its long east-west dimension and its position relative to the Cascades. In response to the differences in precipitation, vegetation changes markedly from west to east. In isolated areas in the extreme northwest part of the county, abundant precipitation produces vegetation very similar to that found on the west side of the Cascade Mountains. Thick conifer forests containing Douglas-fir with vine maple, rhododendron and huckleberry occur. To the east, the forest contains more pine and less abundant undergrowth. Conifer forests extend over much of the western third of the county with oak trees locally in abundance. The forests become thinner east of the Klickitat River canyon; however, dense forests are present at higher elevations along the Simcoe Mountains and Horse Heaven Hills, well into the eastern half of the county. East of the Klickitat River to the eastern edge of the county, the decrease in precipitation causes a transition from the combination of dry forest and grassland of the Goldendale area to the sage brush and cheat grass characteristic of the more arid parts of eastern Washington.

Areal Geography

The overall size of Klickitat County as well as its position relative to major geographical features results in extensive geographical diversity throughout the area. This geographical diversity necessitates division of the county into several areas of similar geography for discussion purposes.

Location of the county's principal communities and drainages are presented in Plates I, II, and III.

Eastern Klickitat County

Most of the county east of Rock Creek is quite similar. With the exception of a part of the Horse Heaven Hills to the north, the area receives little rainfall. When precipitation does occur, lack of vegetation and high relief produces relatively high runoff. As a result, the area has numerous deep canyons but virtually no perennial streams.

The eastern part of Klickitat County, an area of about 600 square miles, has a limited population. Only one community, Bickleton, exists in this area; it has a population of less than 100. Most of the inhabitants are engaged in agriculture, principally dryland farming and cattle production. Farming is practical only on the relatively flat, undissected areas, while the canyons are used principally for grazing. There has been an expansion in irrigated agriculture in the eastern area with recent development of adequate ground-water supply. Crops here are mainly wheat, potatoes, and sugar beets.

Goldendale-Centerville Area

The Goldendale-Centerville area in central Klickitat County is located between the Rock Creek and Klickitat River canyons. This area contains about 700 square miles, divided between conifer forests in the higher northern part and agricultural land in the lower southern part. The northern part is drained by the Little Klickitat River which flows year-round, while the south is drained by intermittent Swale Creek.

The economy of the Goldendale-Centerville area is based principally on agriculture and timber products. The northern part of the area provides substantial forest products, with logging and related milling employing a large number of the area residents. In the southern part of the area, relatively level undissected land and adequate water supplies have resulted in extensive agricultural development. Wheat and alfalfa are the principal crops with irrigation facilitating good production; however, because of the area's elevation the growing season is somewhat limited.

As a result of the combination of forest products and agricultural industries, the Goldendale-Centerville area contains the highest population of the county. Goldendale, the county seat of Klickitat County, has a population of 3275, and population density of the surrounding agricultural areas is higher than most other areas in the county.

Lower Klickitat River Valley

The lower Klickitat River valley extends from the confluence of the Little Klickitat River to the mouth of the Klickitat River near Lyle. The valley is steep-walled and narrow with the valley floor elevation 1000 to 1500 feet lower than the surrounding plateau surfaces. This elevation difference contributes to a milder climate than on the plateau areas.

Although the valley bottom is narrow, there is considerable habitation along the banks of the river. The small community of Wahkaicus is located at the confluence of Swale Creek and the Klickitat River, and about three miles south is the town of Klickitat. In addition to these communities, numerous homesites are located throughout most of the lower valley.

Economic support for the area is principally from the forest products industry, which employs many lower-valley residents. Klickitat is a "company town" of the St. Regis Company and a lumber mill is located here. A small amount of farming and stock grazing is also practiced in the lower valley.

Camas Prairie-Upper Klickitat Basin

The Camas Prairie-upper Klickitat basin area includes the Klickitat River drainage basin above the confluence of Outlet Creek. Although Camas Prairie and the upper Klickitat River basin are part of the same drainage basin, they exhibit distinct geographical differences.

Camas Prairie is a triangular-shaped area of about 50 square miles including most of the Outlet Creek drainage basin. The prairie is nearly flat, with elevation generally varying less than 100 feet, but is surrounded by much more rugged land. The flatness of Camas Prairie and the general abundance of surface-water supplies resulted in its early habitation and agricultural development. Hay production and grazing of beef and dairy stock are the major agricultural activities. Camas Prairie also serves as a gateway to the timbered upper Klickitat basin, and a substantial part of the area's population is involved in logging and other timber-related activities. Because of the accessible nature of Camas Prairie, most of the population of the Camas Prairie-upper Klickitat basin area is located on the prairie. The town of Glenwood (population 300) is the principal community.

The upper Klickitat basin lies north of the Klickitat County line. An area in excess of 360 squares miles, the upper basin lies entirely within the Federated Tribes of the Yakima Nation Reservation in western Yakima County (see Figure 1). Because of its political and geographic location, access to the upper basin is restricted and it is virtually uninhabited.

The upper basin is rugged and relatively high in elevation. The proximity of the area to the crest of the Cascade Mountains and its overall elevation assure abundant precipitation, much of which falls as snow and is retained as snowpack or glacial ice. The precipitation supports good timber growth and logging is the principal economic activity in the area.

Western Highlands

Between the White Salmon and Klickitat River valleys and south of Camas Prairie is a rugged area of limited population referred to here as the western highlands. Much of the highland's northern half is owned by the state or by private timber companies and is relatively undeveloped. The southern half is somewhat more open and contains numerous small farms and ranches. Timber production and ranching are the principal economic activities of the area.

Population of the western highlands is generally sparse, though less so in the south and west. No incorporated towns exist in the area; however, the communities of Appleton, Snowden, and Timber Valley are general population centers. In recent years, the western highlands has become popular for recreation homesites and some subdivision for this purpose is underway.

White Salmon River Valley

The White Salmon River valley in western Klickitat County is highly populated. The valley has a wide level floor suitable for development. Like the Klickitat River valley, the lower elevation of the White Salmon River valley results in a mild climate. The mild climate, flat valley floor, and abundant water have made the area desirable, especially for agriculture. Fruit, particularly cherries, peaches, pears, and apples, is grown in the lower end of the valley. In the upper end, beef and dairy herds are common and much of the land is used for grazing and/or hay production. Like other areas in western Klickitat County, the valley is also headquarters for logging operations in the surrounding hills with much of the timber going to mills in the Columbia River gorge.

Population in the White Salmon valley is relatively dense compared to the rest of the county. The community of Trout Lake is located near the upper end of the valley and the towns of Bingen and White Salmon near the mouth of the river. In addition, much of the valley is occupied by homesites, small ranches, and orchards, many of them around the communities of Husum and BZ Corners.

Columbia River Gorge

The Columbia River occupies a deep canyon along the southern margin of the county. At the eastern end of the county the river is only a few hundred feet lower than the plateau surface to the north; however, the gorge becomes progressively deeper to the west, with differences in elevation between the river and the undissected plateau areas in excess of 2000 feet. Differences in elevation between the river and parts of the Columbia Hills immediately to the north are, in some areas, greater than 3000 feet. This extreme topographic variation isolates the gorge from the rest of the county.

The dramatic geographic separation of the Columbia River gorge from the rest of the county necessitates treatment of the thin, 80-mile-long strip of the county that parallels the river as a separate geographic unit. The strip varies from only a few hundred feet in width to as much as 4-5 miles in some areas.

The depth and narrowness of the gorge has had a limiting effect upon development and population growth. In early years the mild climate and the importance of the river for navigation led to numerous small settlements along the banks of the Columbia. In many areas, orchards and truck farms were established on the flood plain and gravel bars. The establishment of the Columbia River power and navigation systems involved the construction of several large dams on the river, resulted in the disappearance of much of the usable land in the gorge, and forced a reduction in population. The dams have, however, provided irrigation water and hydroelectric power for agriculture and industry. Currently, population in the eastern half of the gorge is primarily centered around the town of Roosevelt, which is located on a wide bench about 150 feet above the river. In the central gorge area, orchards still operate near Maryhill, and a small population center is located here. To the west, the widest habitable location within the gorge occurs in the area of Dallesport, directly across the river from The Dalles, Oregon. Here, a flat bench, roughly equidimensional, supports the small communities of Murdock and Smithville and The Dalles municipal airport. West of Dallesport the communities of Lyle and Bingen occupy small flat areas adjacent to the confluence of the Columbia and the Klickitat and White Salmon rivers.

Like other valleys within the county, the mild climate and abundant irrigation water in the gorge facilitate agricultural production, principally irrigated wheat and fruit. Orchards at Sunnydale, Maryhill, North Dalles, and Bingen produce cherries, peaches, and apples. In addition to fruit orchards, some garden truck is grown in the lower areas near Bingen.

A small plateau, somewhat higher than the Columbia River, is located about halfway between the communities of Maryhill and Roosevelt and is known locally as Goodnoe Hills. The elevation of Goodnoe Hills above the river precludes irrigation, and dryland wheat is the principal crop. The steep hills north of the area have been useful only for cattle grazing.

The availability of inexpensive hydroelectric power has attracted some energy-dependent industries to the gorge. Among these, a large aluminum-refining plant operates near John Day Dam, east of Maryhill, and provides employment for many residents of Klickitat County.

GEOLOGY

Introduction

Because of the relationship between geology and water resources of any area, this study has involved investigation of the county's geology. As the total area of the county is in excess of 1800 square miles, geology was studied largely on a reconnaissance basis with detailed investigation reserved for areas of significance in terms of water use and water resource management. Parts of the county's geology have been studied in the past by Sheppard (1960, 1964, 1967), Newcomb (1969, 1970), Luzier (1969), Laval (1956), Schmincke (1964, 1967), Hammond (1973), and Waters (1955, 1961); however, no previous attempt has been made to study the geology on a county-wide basis.

Figure 14 presents the stratigraphic section present within the county and the informal stratigraphic nomenclature used in the report. On the extreme right-hand side of Figure 14 are four major geologic subdivisions which serve as the major mappable units for this report. Areal distribution of these four units is presented in Plates IV and V, and a discussion of the general stratigraphy of the county is presented below.

Older Volcanic and Volcaniclastic Rocks

The oldest rock units present in Klickitat County are a series of volcanic and volcaniclastic rocks which crop out near the western edge of the county. The sequence is only partially exposed and consists of both pyroclastic and epiclastic rocks with occasional interbedded basaltic and andesitic lavas. Although the two major rock types are discussed below, no attempt was made to differentiate the two in field mapping.

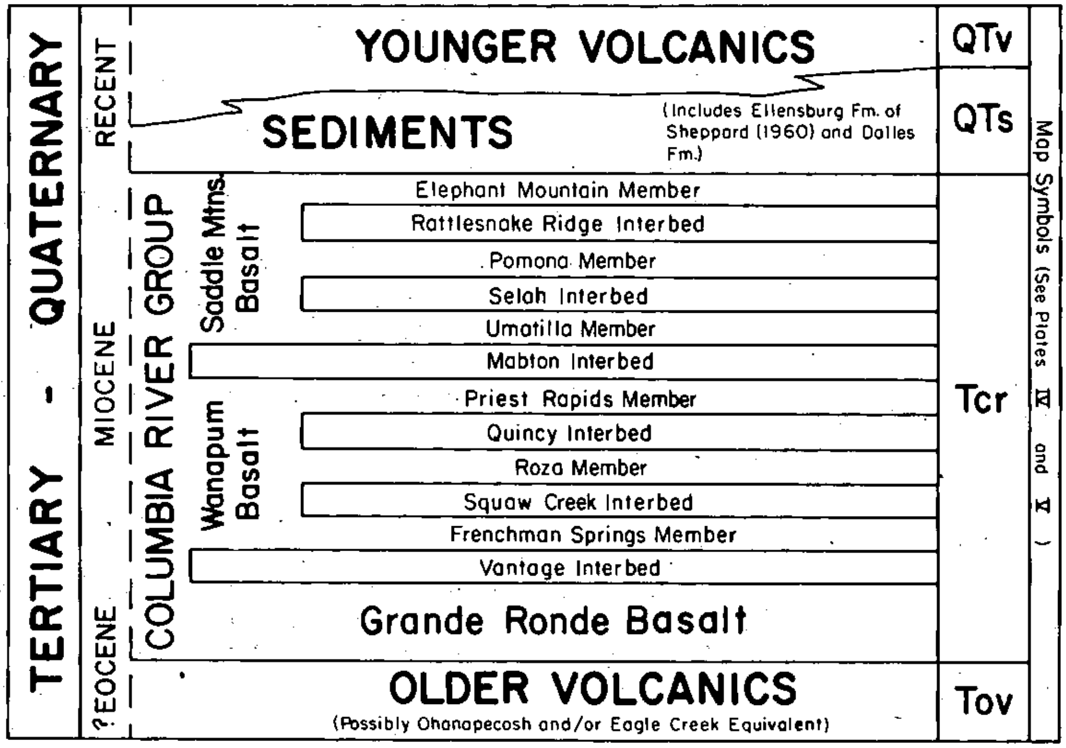

FIGURE 14. Informal stratigraphic nomenclature used in this report.

<u>Volcaniclastic Rocks</u>

The exposures of this older unit in Klickitat County consist primarily of pyroclastic units with a limited amount of epiclastic material. The pyroclastics consist mainly of thick sequences of tuff breccias with some interbedded tuff units. The tuff breccias contain clasts of andesite and pumice in an ashy matrix composed primarily of glass shards and small rock fragments which are usually altered and commonly are a green or red-green color. According to Wise (1970) and Fiske and others (1963), tuff breccias of the Ohanapecosh Formation were probably deposited as subaqueous pyroclastic flows. Evidence for this mode of formation includes not only the composition of these tuff breccias but also the fact that reworking of the material is evident in many of the breccia units.

In addition to the relatively abundant pyroclastic rocks, there are lesser amounts of epiclastic rocks, generally in the form of volcanic sandstones and some volcanic conglomerates. The sandstones occur as thin-bedded (less than 10 feet) layers of sand-sized volcanic detritus consisting mainly of rock fragments and plagioclase. In general, the sandstone is uncemented and friable and most of the material is deeply altered. Exposures of these epiclastic units within Klickitat County appear as thin layers beneath lava flows interbedded with the tuff breccias. The very nature of these epiclastic deposits and their close relationship with the interbedded lavas suggest that the sandstones and conglomerates were deposited subaerially.

Volcanic Rocks

Associated in limited quantity with the volcaniclastics are interbedded basaltic and andesitic lavas. Within the county area the total extent and thickness of individual flows was indeterminable; however, Wise (1970) reports similar flows in the Ohanapecosh Formation west of Klickitat County to be from 50 to 75 feet thick and traceable as far as seven miles.

These interbedded lavas appear gray, green-gray, or maroon and generally lack primary features such as columnar jointing and ramp structures. The lavas are generally hypocrystalline and commonly contain abundant small plagioclase phenocrysts (3-5 mm). In hand specimen, the basalts will occasionally resemble those of the Columbia River Basalt Group; however, major-element chemical analyses of the older basalts indicate higher silica and aluminum and lower titanium, iron, and calcium than the chemical types of the Columbia River Basalt Group (Table 1). Major-element chemistry of the older basalts also differs from that of the much younger olivine basalts, having higher silica and lower iron than the younger group.

TABLE 1: Major-element chemical analyses of selected volcanics, Klickitat County, Washington.

Element Oxide	Sample (Percent) A	B	C	D	E	F
SiO_2	59.67	58.55	53.36	50.37	48.70	53.04
Al_2O_3	16.30	17.27	14.82	13.93	16.49	17.59
TiO_2	1.23	0.78	1.68	2.97	2.89	1.68
Fe_2O_3	2.00	2.00	2.00	2.00	2.00	2.00
FeO	6.25	7.66	9.63	12.38	12.23	7.92
MnO	0.18	0.25	0.19	0.25	0.29	0.14
CaO	7.31	6.22	8.81	8.23	8.57	8.81
MgO	2.76	2.81	5.60	5.27	5.22	5.34
K_2O	1.77	0.89	1.16	1.45	0.89	0.72
Na_2O	2.23	3.14	2.45	2.59	2.72	2.52
P_2O_5	0.28	0.42	0.30	0.56	0.08	0.25

Sample Locations

A. From older volcanics in NW 1/4, SE 1/4, sec. 8, T. 6 N., R. 10 E., about 0.25 mi. west of forest service road and north of power line clearing.

B. From older volcanics in SW 1/4, SW 1/4, sec. 20, T. 6 N., R. 10 E., about 0.75 mi. up Sugar Bowl Butte road.

C. From flow of Grande Ronde Basalt in NW 1/4, NW 1/4, sec. 16, T. 4 N., R. 14 E., about 0.1 mi. south of junction of Klickitat and Little Klickitat rivers.

D. From flow of Frenchman Springs Member, same location as C.

E. From flow of younger olivine basalt in SW 1/4, SE 1/4, sec. II, T. 4 N., R. 14 E.

F. From flow of younger olivine basalt in Klickitat County Road Department Quarry. NE 1/4, sec. 2, T. 4 N., R. 16 E.

Occurrence

Exposure of these units is limited to the extreme western and northwestern edges of the county. The thickness and extent of the units is not well known because their vertical and horizontal limits are not exposed. The distribution of these units is masked by much younger volcanics of Mt. Adams and King Mountain as well as by the basalts of the Columbia River Group. Core drilling done as part of a potential reservoir investigation (North Pacific Consultants, 1960) on the east side of Trout Lake Creek encountered similar volcanic material, suggesting that parts of the units may be extensive in the subsurface.

The best exposure of the volcaniclastics occurs on the west side of a Forest Service road in Section 8, T. 6 N., R. 10 E., where 1200 feet of the units are exposed in a near-vertical cliff (Figure 15). However, neither the top nor bottom of this section is exposed and it is likely that the unit may

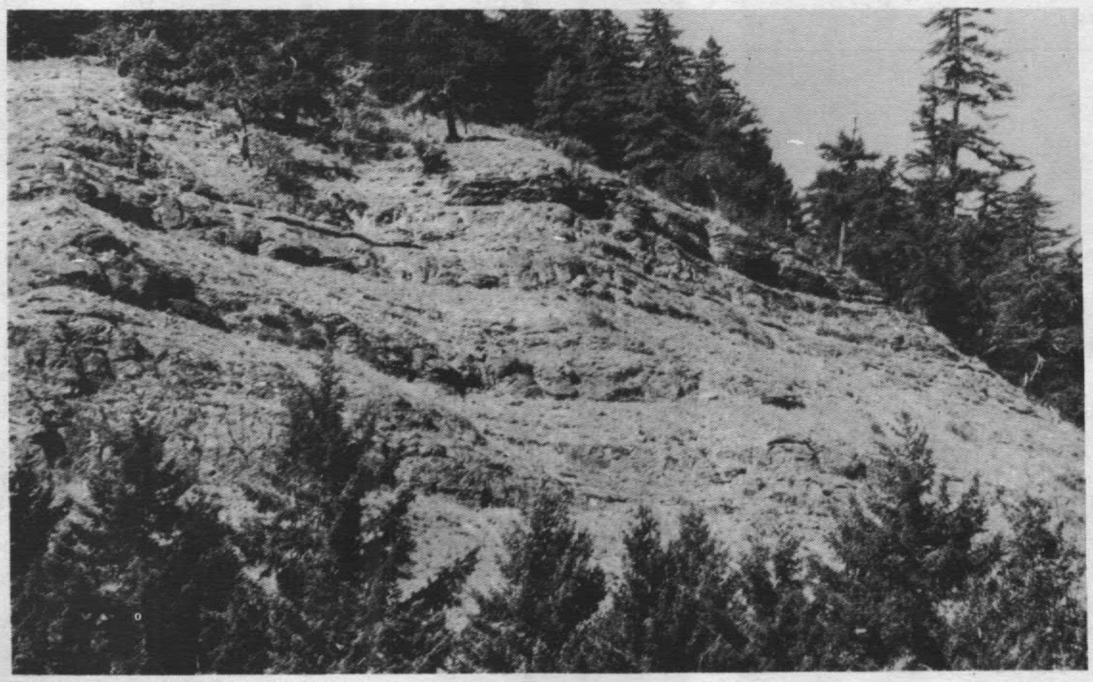

FIGURE 15. Exposure of older volcaniclastic rocks northwest of Trout Lake, Washington.

be substantially greater in thickness. Wise (1970) reports a section of similar lithology and stratigraphic position, approaching 19,000 feet in thickness, in the Wind River area west of Klickitat County.

Good exposures of older volcanics are present in a quarry just west of Trout Lake at the junction of State Highway 14 and a Forest Service road in the NE 1/4 sec. 21. T. 6 N., R. 10 E. Other exposures of this volcanic sequence are found in the Sugarbowl Butte area (Secs. 19 and 20, T. 6 N., R., 10 E.).

Age

The lack of a complete stratigraphic section and the generally poor exposure of this unit makes determination of age and stratigraphic position somewhat difficult. However, because of the similarity to the thick tuff breccia described by Fiske and others (1963) and Wise (1970), and because of recent work by Hammond (1973), it is suggested that the unit may be equivalent to part of the Ohanapecosh Formation as defined by Waters (1961). Although the volcaniclastics appear to resemble the Ohanapecosh, the interbedded basalts appear much less altered than those described by Fiske and Wise.

No fossil material for dating was found in any of the exposures within Klickitat County. Fiske and others (1963) assigned an age of Eocene to the Ohanapecosh based on plant fossils found by them and by Fisher (1957) in Mount Rainier National Park. Fossils collected by Wise (1970) in the Wind River area, west of Klickitat County, indicated an Oligocene age; no Eocene forms were present. Because it is impossible at this time to determine the stratigraphic relationship between the exposures in Klickitat County and those elsewhere, an age of Eocene to Miocene is assumed.

Columbia River Basalt Group and Related Sedimentary Interbeds*

The most extensive geologic units occurring in Klickitat County are the basalts of the Columbia River Group. These basalts form the high, dark brown to black cliffs along the sides of the Columbia River gorge and other major canyons in the area. The basalts underlie almost all of the county and are the county's principal ground-water source. The total thickness of the basalts is unknown, but exploratory drilling in the Rattlesnake Hills northeast of the county terminated at a depth in excess of 10,000 feet without completely penetrating basalt. While the Columbia River Basalt group may not be this thick in Klickitat County, the presence of increasingly younger flows from west to east indicates substantial increase in thickness occurring within the county. Maximum thickness may be on the order of several thousand feet.

Age

The age of the Columbia River basalt was for some time subject to question. Smith (1903) assigned a date of early to middle Miocene based on stratigraphic relationships in the Yakima Valley. Waters (1955) later reported the occurrence of fresh-water mollusks in sediments interbedded in the upper part of the basalt sequence to which an age of Pliocene was assigned. Later work by Sheppard (1960) on diatoms from exposures north of Satus Pass

*In order to maintain stratigraphic continuity in this section, sedimentary units interbedded with basalts of the Columbia River Group will be discussed in their proper sequence. The sediments are not part of the Columbia River Basalt Group and have been assigned by some to the Ellensburg Formation; however, for reasons which will be discussed later, the Ellensburg Formation designation is not used in this report.

indicated an age of early Pliocene. Recently, work by Berggren and Van Couvering (1974) has resulted in the re-establishment of the Miocene-Pliocene Boundary as no older than 5.3 million years. As a result, potassium-argon dates and palentologic data indicate that eruption of the entire Columbia River Group occurred within the Miocene (Swanson and others, in press).

The large number of individual units recognized within the Columbia River Basalt Group and the importance of this group to the hydrology of the county, necessitate a brief stratigraphic discussion of the Columbia River Basalt Group and related interbedded sediments. The nomenclature used for the basalt units is that proposed by Swanson and others (in press), and is presented in Figure 14.

Grande Ronde Basalt

The Grande Ronde Basalt is made up of an undetermined number of flows which, in some areas of the Columbia Plateau, total several thousand feet in thickness. Grande Ronde basalts are typically massive, dense, finely crystalline, and normally aphyric. Upon close examination, however, many Grande Ronde flows are found to contain microphenocrysts of plagioclase and pyroxene in varying amounts. Investigations of major-element chemistry indicate that the Grande Ronde Basalt is significantly different from other basalts in the Columbia River Group and warrant the establishment of a separate chemical type (Wright and others, 1973).

Because of their finely crystalline, uniform nature, Grande Ronde flows commonly outcrop as massive flows 100 to 200 feet thick and are often characterized by a close, hackly jointing pattern. Well-developed columnar jointing in the colonnade is generally lacking. Thick vesicular flow tops often cap the massive flows.

Surface exposure of the Grand Ronde Basalt is limited within Klickitat County. Known exposures are restricted to the deeper parts of the Klickitat River and Rock Creek canyons and to the exposed central parts of some of the major anticlinal structures, particularly in the west and southwest parts of the county. In spite of their limited surface exposure, Grande Ronde basalts are likely present in the subsurface throughout much of the county.

Vantage Interbed

Directly overlying the Grande Ronde Basalt is a sedimentary interbed which is correlative with the Vantage sandstone described by Mackin (1961). Within Klickitat County the interbed exhibits considerable variation in composition. In the Rock Creek canyon it consists predominantly of well sorted, fine-grained micaceous and tuffaceous sands (Figure 16). To the west in the

FIGIRE 16. Vantage interbed overlain by basalt of the Frenchman Springs Member along Goldendale-Bickleton Road in Rock Creek Canyon, Klickitat County, Washington.

Klickitat River canyon it consists of a large basaltic boulders and cobbles in a tuffaceous matrix.

Like most interbeds, the Vantage is easily eroded. Thus its known exposures are limited, occurring mainly in road cuts or other recent excavations. Known exposures of the Vantage interbed do not exceed 20 feet in thickness and are limited to the Klickitat River, Rock Creek, and Columbia River valleys. It is likely, however, that the interbed is exposed in some of the major anticlinal structures elsewhere in the county.

Wanapum Basalt

Flows from the Wanapum Basalt are well exposed in Klickitat County, particularly in the western and central two-thirds of the county. Wanapum flows commonly exhibit a greater lithologic variation than those of the Grande Ronde Basalt, and for this reason it is easier to define and trace individual flows or groups of flows of the Wanapum Basalt. A brief description of the units within the Wanapum Basalt is presented below.

Frenchman Springs Member: Resting directly upon the Vantage interbed and lowermost in the Wanapum Basalt is a group of flows named by Mackin (1961) as the Frenchman Springs Member. Frenchman Springs flows are characterized by fine crystallinity and a generally uneven distribution of plagioclase phenocrysts. The variable distribution of phenocrysts is a characteristic of Frenchman Springs flows, and lateral tracing of the flows reveals considerable variation in phenocryst density over short distances. In addition to their variable density, phenocrysts in the Frenchman Springs basalts are often clotted in large glomerocrysts. Within Klickitat County the phyric nature of the Frenchman Springs Member appears to be restricted to the lower flows. In many areas within the county, the upper flows exhibit relatively few phenocrysts and the uppermost flow is often aphyric.

Individual Frenchman Springs flows are generally thick and massive with large, well-developed columns, particularly in the lower part of the member. Individual flow thicknesses vary within the county but commonly exceed 100 feet.

Exposures of the Frenchman Springs flows occur over large areas of the county. Much of the basalt exposed in the west and central parts of the county, including many of the flows exposed in the Columbia River gorge, and Klickitat River canyon is assigned to the Frenchman Springs Member.

Squaw Creek Interbed: Mackin (1961) described a diatomite bed that overlies the Frenchman Springs Member and called it the Squaw Creek Diatomite. Within Klickitat County no interbed was found between the Frenchman Springs and overlying Roza members. However, in the Roosevelt area, a diatomite bed occurs between the Frenchman Springs and Priest Rapids members which may be, in part, stratigraphically equivalent to the Squaw Creek interbed.

Roza Member: Overlying the Frenchman Springs Member is a distinctive flow named the Roza Member by Mackin (1961). The Roza is a dense basalt of medium crystallinity which contains abundant plagioclase phenocrysts. Unlike similarly appearing flows within the Frenchman Springs Member, the Roza has a remarkably uniform distribution of phenocrysts throughout its entire extent. In addition, the phenocrysts tend to be individually distributed rather than as glomerocrysts typical of Frenchman Springs flows.

The Roza Member is relatively thin, generally less than 100 feet in thickness, and lacks good columnar jointing. The unit is often highly fractured which facilitates relatively rapid weathering. Because of its tendency to weather readily, exposure of the Roza within the county is poor.

The extent of the Roza within Klickitat County is not well known. It appears that the flow is present over much of the county; however, evidence suggests that it might not be present north and west of the confluence of the Klickitat and Little Klickitat rivers. The Roza crops out frequently east of the Little Klickitat River canyon and is found near the surface as far east as Rock Creek canyon. East of the canyon, however, the presence of flows of the Saddle Mountain Basalt indicate that, if present, the Roza is buried at considerable depth. Examination of a section near Roosevelt reveals no Roza Member present, and it is quite possible that the flow may not be present in the subsurface over much of the eastern third of the county.

Quincy Interbed: An interbed similar to one designated as the Quincy diatomite by Mackin (1961) is present throughout most of Klickitat County as tuffaceous sand and silt. The interbed rarely exceeds 5 feet in thickness but often is associated with a substantial pillow-palagonite complex formed at the base of the overlying flow (see Figure 17). In the Roosevelt area a thin diatomite bed (1-2 feet) is present between the Frenchman Springs and Priest Rapids members and may be equivalent, in part, to the Quincy interbed.

Priest Rapids Member: The uppermost sequence of flows included in the Wanapum Basalt is the Priest Rapids Member (Mackin, 1961). Basalts of the Priest Rapids Member are often distinctive as they are commonly coarsely-crystalline and often glassy in appearance. In contrast to the underlying Roza Member, Priest Rapids flows are commonly aphyric. Individual flows are dense, massive, and often exhibit well-developed columnar jointing. In the type section Mackin described four Priest Rapids flows with a combined thickness

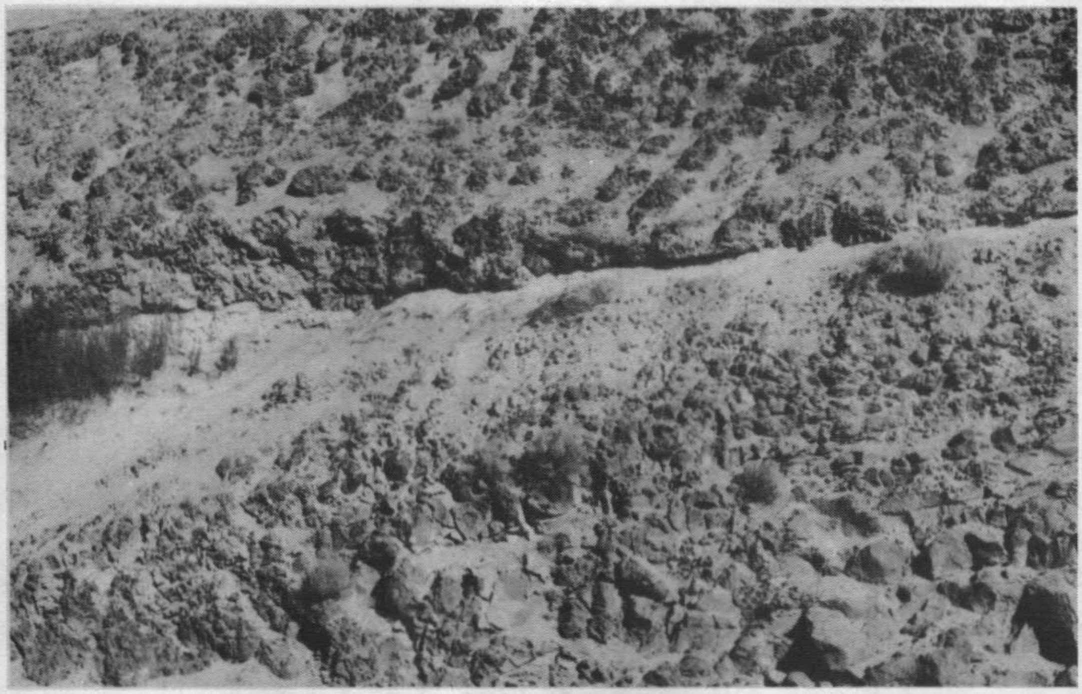

FIGURE 17. Contact of Priest Rapids and Roza members along State Highway 14 near Maryhill, Washington. Thick pillow-palagonite of Priest Rapids flow overlies thin interbed and Roza Member.

of about 220 feet. However, within Klickitat County, never have more than two flows been found and the total thickness ranges between 100 and 200 feet.

Exposures of the Priest Rapids Member are generally limited to the central Columbia gorge and to local areas in the central part of the county. Exposures of Priest Rapids flows are common in the Klickitat, Rock Creek, and Columbia River valleys.

<u>Mabton Interbed</u>: In the southerwestern part of the Columbia Plateau, the Wanapum and Saddle Mountain basalts are separated by a substantial tuffaceous interbed named, by Laval (1956), as the Mabton interbed. In most areas the interbed consists of tuffaceous sands and silts and massive tuffs. In the

extreme east and southeastern part of the county the interbed becomes more of a cross-laminated sandstone with associated small pebbles of andesite.

In the eastern end of the county the Mabton interbed ranges from 30 to 50 feet in thickness, although subsurface information suggests that substantial thinning of the unit may occur to the north and west. The Mabton interbed is present mainly in the subsurface with surface exposures occurring only where erosion has cut sufficiently deep into the stratigraphic section. In many of the canyons south and east of Bickleton the Mabton is easily recognized as a prominent bench in the otherwise near-vertical canyon wall.

Saddle Mountains Basalt

Above the Wanapum Basalt is a group of flows recognized as the final outpouring of Columbia River fissure eruptions. These flows, previously referred to as the upper Yakima basalt, have been called the Saddle Mountains Basalt by Swanson and others (in press). Flows of the Saddle Mountains Basalt are generally more limited in extent than those of the Wanapum or Grande Ronde basalts and are centered in and around the Pasco Basin. Several of the Saddle Mountains flows occur in eastern Klickitat County.

Umatilla Member: Overlying the Mabton interbed in most of the eastern third of Klickitat County is a very dense, massive basalt named the Umatilla Member (Laval, 1956). Laval included the Umatilla within the Priest Rapids Member; however, Schmincke (1964) later separated the flow based upon its physical characteristics and areal distribution. The Umatilla is commonly a massive, very finely-crystalline black basalt containing no phenocrysts. The flow normally exhibits poorly defined columnar jointing and, in many areas, has a thick vesiculated top. The dense, uniform nature of the Umatilla makes it more resistant to weathering than most flows and it often forms a substantial part of many of the steep canyon walls in eastern Klickitat County.

Exposures of the Umatilla Member are generally restricted to canyon walls in the area south and east of Bickleton. In these areas the thickness of the unit approaches 200 feet. In some areas, the Umatilla appears to consist of two separate flows while in others only one thick flow is evident.

Unlike most flows in the Columbia River Basalt Group the Umatilla Member is usually easily recognized in borehole geophysical logs. Crosby and others (1972) recognized that the Umatilla flow characteristically exhibited a high natural gamma response which facilitated the flow's identification in geophysical logs. The ability to identify the Umatilla Member in the subsurface greatly facilitates delineation of its areal extent within the county. Interpretation of borehole geophysical logs and surface exposures indicates that the Umatilla Member underlies much of eastern Klickitat County but pinches out between Cleveland and Rock Creek canyon to the west. The stratigraphic section at Rock Creek lacks evidence of the Umatilla Member but exposures of the flow do occur in Spring Creek canyon approximately 8 miles to the east. The southern extent of the Umatilla flow appears to coincide generally with the axis of the Swale Creek syncline. The flow has been traced south along Pine Creek canyon to a point near the center of Section 8, T. 4 N., R. 21 E., where it can be seen to pinch out. South of this location, in the Roosevelt area, the Umatilla Member is not present.

<u>Selah Interbed</u>: Overlying the Umatilla Member is a tuffaceous interbed which Schmincke (1964) has called the Selah. The term Selah has a somewhat confused history because Mackin (1961) used it to include all interbeds between the Roza and Pomona members. Schmincke suggested restricting the term

to the interbed above the Umatilla (when the Umatilla is present) and above the Priest Rapids Member when the Umatilla is not present. This, however, creates some confusion with the underlying Mabton interbed. In this report the terms Mabton and Selah will be used to define the interbeds surrounding the Umatilla Member. When the Umatilla is not present, the interval will be referred to as the Mabton-Selah interbed.

The Selah is generally a silty tuff, bleached white-to-tan; however, Schmincke (1964) reports a vitric tuff to be present in some areas. Within the county the Selah is present as a thin interval on top of the Umatilla Member. The interbed ranges from 5 to 15 feet in thickness, generally thickening slightly toward the south. In the Roosevelt area where the Umatilla Member is not present, the Mabton-Selah interbed reaches a thickness of nearly 200 feet. A much thinner Mabton-Selah is present between the Pomona and Priest Rapids Members in the Lyle area of western Klickitat County.

Pomona Member: Overlying the Selah or Mabton-Selah interbed is a distinctive basalt flow named the Pomona by Schmincke (1964). The flow was originally named the Wenas basalt by Smith (1903), but the term was abandoned because of considerable confusion which developed from later work.

The Pomona Member is a dense finely-crystalline basalt with abundant, uniformly distributed plagioclase microphenocrysts. The microphenocrysts are generally 1 to 2 mm in size and are often found in glomerporphyritic clusters. Because of its unique appearance the Pomona is often readily recognized in the field.

The Pomona commonly exhibits small, well-developed columns, at least in part of the flow. In some areas the columns of the Pomona exhibit a distinctive undulating appearance that can be quite striking. Occasionally columns will be broken by evenly-spaced horizontal jointing which produces an abundance of polygonal blocks. Total thickness of the Pomona Member normally exceeds 100 feet, and information from geophysical logs indicates that it may approach 200 feet in some areas.

Exposure of the Pomona Member is relatively common in the eastern part of Klickitat County as the flow forms the gently dipping, undissected surface from Harrison Creek east to the Spring Creek Canyon-Sand Hill area. While occurrence of the Pomona is generally restricted to the area east of Rock Creek, it also appears in the Columbia River gorge along the southern edge of the county. Exposures within the gorge occur as far west as Lyle where Schmincke (1964) measured a section of Pomona totalling 100 feet.

Rattlesnake Ridge Interbed: Overlying the Pomona Member is the Rattlesnake Ridge interbed (Schmincke, 1967). Rattlesnake Ridge sediments are predominantly tuffaceous with some micaceous sands and silts. The interbed is exposed in the county only where erosion or excavation has cut away the overlying Elephant Mountain basalt. The interbed is generally 20 to 50 feet thick. The Rattlesnake Ridge is commonly restricted to the Alderdale, Dead Canyon and Glade Creek areas in the extreme eastern part of the county; however, isolated exposures of the interbed have been found in the upper reaches of Squaw Creek canyon west of Cleveland (Figure 18).

Elephant Mountain Member: The youngest basalt of the Columbia River Group exposed in Klickitat County is the Elephant Mountain Member. Originally two flows, the Elephant Mountain and the Ward Gap, were defined by Schmincke; however, Swanson and Wright (1976) later showed the two to be identical in composition and thus the term Ward Gap was dropped. The Elephant Mountain member is finely crystalline and sparsely porphyritic. In general, the

FIGURE 18. Elephant Mountain Member overlying Rattlesnake Ridge interbed along Goldendale-Bickleton Road, west of Cleveland, Washington.

phenocrysts are plagioclase with lesser amounts of pyroxene and phenocrysts increase in number near the bottom of the flow. The Elephant Mountain Member is relatively thin, generally less than 50 feet, and exhibits poorly developed columnar jointing. Associated with the columnar jointing are abundant cross fractures which give the flow a hackled appearance similar to that of many Grande Ronde flows. The fractures allow the flow to weather to rubble of roughly equidimensional angular blocks.

Exposure of the Elephant Mountain Member is generally restricted to the extreme eastern end of the county where it is at, or near, the surface in many areas. Because of its proximity to the existing topographic surface, it is questionable whether a complete section of the Elephant Mountain is present in the county. Isolated exposures of the Elephant Mountain Member also occur in Squaw Creek canyon, west of Cleveland (Figure 18).

Tertiary-Quaternary Sediments

Occurring in many areas of the county are sequences of sediments which vary in thickness and composition and which overlie the basalts of the Columbia River Group. The sediments are normally poorly indurated and quite susceptible to weathering; thus, their occurrence is restricted to topographically low areas or to areas where younger volcanics form a protective cap. Because of their highly variable nature, the sediments have been the source of many problems in the stratigraphy and geologic nomenclature of south-central Washington.

Distribution and Description

Sediments occupying a similar stratigraphic position occur in several areas within Klickitat County. In the Goldendale area and Little Klickitat River drainage, the sediments are poorly indurated, meta-quartzite-bearing conglomerates, gravels, and micaceous sands and silts. The sediments are usually poorly sorted and, although meta-quartzite accounts for 50-60% composition, andesites and basalts are also present in much lesser amounts (Sheppard, 1960). The matrix material is normally micaceous sand and silt; however, in a few areas, the matrix is highly tuffaceous. The sediments are quite noticeable in outcrop because of their bright brown to reddish brown color, due apparently to secondary ferruginous staining, and because when present, the meta-quartzite pebbles litter the immediate area.

Thickness of this sedimentary unit in the Goldendale area varies considerably. In some places, younger basalts can be found to overlie basalts of the Columbia River Group with little or no sediment present. In other places, exposures of 50 to 100 feet are common and drilling information indicates that thicknesses may reach 200 feet or more.

Because of the poorly indurated nature of these sediments, exposure in the Goldendale area is generally restricted to locations where erosion or construction has cut through the protective cap of younger volcanics. Good exposures of these sediments are found along U. S. Highway 97 between Goldendale and Satus Pass. Drilling information and exposure of similar sediments along the Goldendale-Glenwood road suggest that the sediments may be present beneath the younger volcanics over much of the area north and west of Goldendale.

Exposures of similarly-appearing deposits are present eastward from Goldendale to the Bickleton area. East of Rock Creek the sediments are nowhere overlain by younger volcanics and they appear to contain substantially greater percentages of basaltic and andesitic material. Mapping of these sedimentary deposits between Bickleton and Rock Creek revealed abundant meta-quartzite pebbles with relatively little fine matrix material. This suggests that erosion has removed the finer fraction and that the exposures represent a lag concentrate or even redeposition. Therefore, deposits in the Bickleton area may not be direct correlatives with those in the Goldendale area.

South of Goldendale, in the Swale Creek valley, similar sediments are exposed. Here, the sediments occupy a shallow synclinal basin and are generally not overlain by younger volcanics. However, in the southeast quarter of Section 28, T. 3 N., R. 15 E., a small tongue of younger volcanics from Haystack Butte appears to overlie the sediments. In the Swale Creek sediments meta-quartzite gravels are interbedded with tuffs and tuffaceous and micaceous sands (Figure 19). This arrangement suggests that the quartzite pebbles in the deposits may have been reworked to some degree. Total thickness of the deposits in the Swale Creek valley is unknown but a few wells drilled in the sediments penetrate thicknesses in excess of 200 feet.

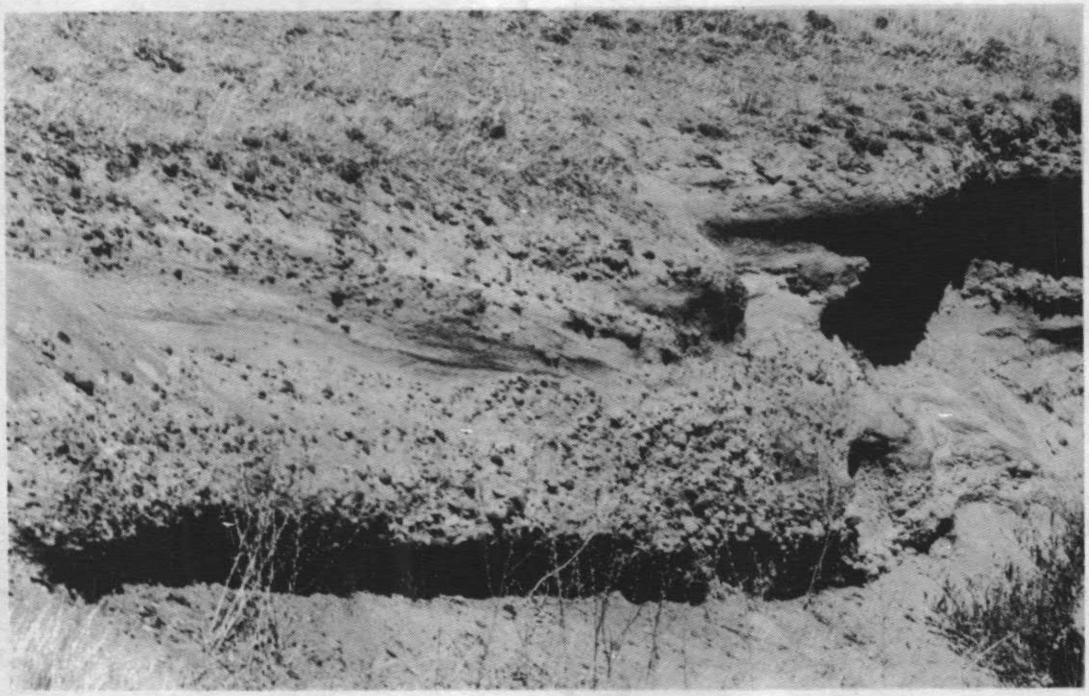

FIGURE 19. Tertiary-Quaternary sediments in Swale Creek valley, west of Warwick, Washington.

West and south of the Goldendale-Centerville area sedimentary deposits occupying a similar stratigraphic position have been called part of the Dalles Formation. In these areas the sediments contain few quartzite pebbles and are mainly volcaniclastics, predominantly basalt and andesite pebbles in a tuffaceous matrix. In some areas a welded tuff is present. Thickness of the Dalles Formation north of the Columbia River rarely exceeds 100 feet; however, exposures south of the river approach 1800 feet in thickness (Newcomb, 1969).

Age and Stratigraphic Nomenclature

Age, stratigraphic relationship, and nomenclature of these sedimentary deposits in the county pose some questions. The similarity of the sediments exposed in the Goldendale area with those of the Yakima area led Waters

(1955), and later Sheppard (1960), and Luzier (1969), to assign them to the Ellensburg Formation. Newcomb (1969) assigned sediments of a similar stratigraphic position in the southwestern part of the county to the Dalles Formation, based upon their lithologic similarity with the Dalles Formation south of the Columbia River. The sediments in Swale Creek valley appear to occupy a similar stratigraphic position, but both Luzier and Newcomb were reluctant to assign them to either the Ellensburg or the Dalles formations. Furthermore, exposures have been found in which sediments containing metaquartzite pebbles are found between flows of younger volcanics.

Because of the confusing stratigraphic relationships and the existence of at least two well-established geologic names, no effort is made in this report to redefine ages or names of these disparate sedimentary deposits. Instead, the term Tertiary-Quaternary sediments is used to include all of these deposits.

The uncertainty associated with the stratigraphic relationships of these sedimentary deposits also poses problems for determination of age. Newcomb (1966) suggested an age of early-to-middle-Pliocene for the Dalles Formation, and this age would seem plausible for areas where the sediments can be seen to conformably overlie the Columbia River basalt. In areas where an unconformable relationship exists and where sediments are interbedded within flows of younger volcanics, a much more recent age is suggested. Thus, a general age range of Pliocene to Recent is used herein to include all units mapped as Tertiary-Quaternary sediments.

Tertiary-Quaternary Volcanics

Extending over much of the western half of Klickitat County is a sequence of volcanics younger than the Columbia River Basalt Group. These volcanics are highly variable in composition and distribution, and the stratigraphic relationship of individual units is not well known. In general, the volcanics consist of two groups: one is predominantly olivine basalt and the other includes rhyolites, dacites, and andesites.

Olivine Basalt

The younger olivine basalts are, in most cases, easily distinguished from the basalts of the Columbia River Group. In contrast to the uniform, dark, generally aphyric flows of the Columbia River Group, the younger olivine basalts commonly appear as thin gray flows, often highly phyric. Flow thickness is generally 15-20 feet, but ranges from as little as 5 feet to as much as 50 feet. The basalts are generally holocrystalline and are commonly coarse-grained. Sheppard (1960) noticed that two distinctive textural types were discernible in the field. One is typified by an intergranular texture and is finely-crystalline. The other is characterized by a well-developed diktytaxitic texture. Both textural types are commonly phyric and contain abundant olivine and plagioclase phenocrysts. Sheppard reports that the type characterized by diktytaxitic texture commonly exhibits flow alignment of plagioclase phenocrysts. Olivine phenocrysts in both types are commonly altered to iddingsite. Comparison of major-element chemistry of the olivine basalts and basalts of the Columbia River Group reveal distinct differences (see Table 1). The younger olivine basalts are characterized by higher aluminum and a lower iron and phosphorous content than the Columbia River types.

Other Volcanics

Occurring less frequently than the olivine basalt, the dacite, rhyolite, and andesite flows are limited in areal extent. The dacites are commonly pale tan, purplish-tan to gray and contain phenocrysts of plagioclase, olivine, and hornblende. The rhyolites generally exhibit flow banding with alternating light and dark pale bands. The rhyolites are porphyritic but generally contain less than 3 percent phenocrysts (Sheppard, 1960), normally plagioclase. Quartz, magnetite, and zircon are also present. Sheppard (1960) also reports rare inclusions of basalts of the Columbia River Group and younger olivine basalts in the rhyolite flows.

In addition to the dacites and rhyolites, several andesite flows have been recognized by Sheppard (1960, 1964, 1967). The andesites are commonly light gray with flow-aligned phenocrysts of plagioclase and hypersthene. Thickness of the flows is generally less than 100 feet. However, Sheppard (1967) reports an andesite flow in the upper Klickitat River canyon that is in excess of 350 feet thick.

Occurrence

Plates IV and V show the distribution of the younger volcanics in Klickitat County. As can be seen, the volcanics are generally restricted to the northern and western parts of the county. The volcanics form part of the Simcoe Mountains, north of Goldendale, as well as King Mountain and Camas Prairie near Glenwood. In the Goldendale area, the Little Klickitat River appears to mark the southern boundary of the younger volcanics except for local volcanic centers at Lorena and Haystack Buttes and some exposures south of the Little Klickitat-Klickitat River confluence. No exposure of younger volcanics have been found east of Rock Creek. Most of the area shown as Tertiary-Quaternary volcanics is younger olivine basalt; however, some dacites, rhyolites, and andesites are also present.

In general, individual flows are of limited extent. Sheppard reports flows extending as much as 14 miles; however, most appear to be much more restricted. Many flows occur as channel fillings in the larger canyons and in smaller drainages. Figure 20 illustrates this channel filling on a limited scale in which younger volcanics cut into a Priest Rapids flow. Of two younger basalt flows which are present here, one is entirely restricted to the channel. In addition, both the Klickitat and White Salmon River canyons are partially filled with younger volcanics. These valley-filling flows clearly indicate that the major drainages were well established by the time of the extrusion of the younger basalts.

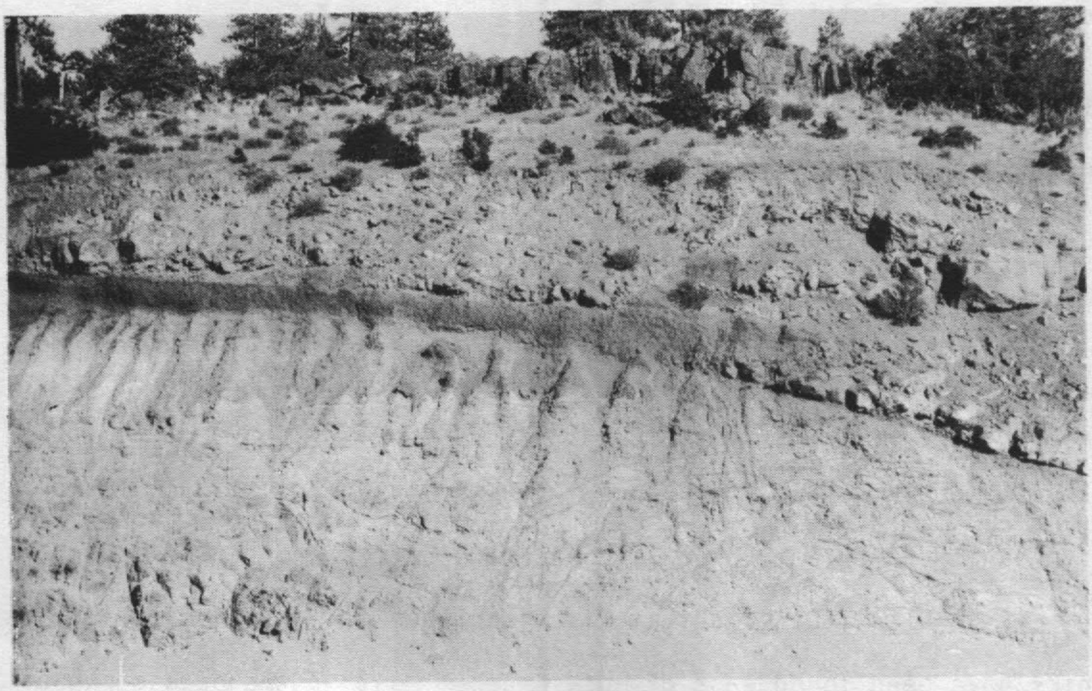

FIGURE 20. Younger olivine basalt filling channel cut into Tertiary-Quaternary sediments and weathered Priest Rapids Member along U. S. Highway 97, north of Goldendale, Washington.

Age

The age of the younger volcanics is not well known. Stratigraphic relationships indicate that the volcanics are younger than Wanapum Basalt and at least the Pomona Member of the Saddle Mountains Basalt. Potassium argon dates obtained by Shannon and Wilson, Inc. (1973), on the younger volcanics indicate absolute dates from 4.5 to 0.03 million years. These dates and the overall stratigraphic relationships would indicate an age span of Pliocene to Recent. Work by Sheppard (1960, 1964), Hammond (1973), and Shannon and Wilson seem to indicate a general decrease in age of the younger volcanics from east to west.

Unconsolidated Deposits

In many areas of the county, bedrock is overlain by unconsolidated sedimentary deposits. In most places these deposits consist of gravels, sands, and silts of glacial and/or glaciofluvial origin. While most occurrences of these deposits are restricted to the Columbia River gorge, deposits also occur in the Camas Prairie area and in the eastern part of the county.

Unconsolidated deposits near the eastern margin of Klickitat County consist mainly of slack-water silts and occasional gravel deposits related to glacial flooding. The slack-water silts were apparently deposited up to an elevation of 100 feet in the eastern half of the county and isolated deposits of these silts persist in protected back-water areas of the canyons. In addition to the slack-water silts, ice-rafted erratics of granite and metaquartzite can also be found.

Unconsolidated gravels, sands and silts are present at many localities in the Columbia River gorge. Most of these deposits are of limited areal extent, and thicknesses seldom exceed 50 feet. In several places between Lyle and Bingen the sediments were quarried for road building and dam construction in the gorge. In both the Columbia River gorge and the eastern part of the county these sediments are of limited extent and distribution. In the Camas Prairie area the unconsolidated sediments are much more extensive, and Cline (1976) reports that thicknesses near the southwestern end of the prairie exceed 160 feet. Because of their thickness and extent, the unconsolidated sediments in the Camas Prairie area are an important groundwater source.

With the exception of the Camas Prairie area, the unconsolidated sediments are highly variable in occurrence and relatively unimportant to the county's water resources. For these reasons their distribution is not shown on Plates IV and V; however, the section on ground-water occurrence contains a discussion of their importance to the Camas Prairie area.

Structure

Introduction

The relationship of geologic structure to water distribution and occurrence has long been recognized. Newcomb (1961) illustrated the importance of this relationship for basalt aquifers and suggested that faults and folds within the basalts can act as either barriers or conduits for the movement of ground water. It is evident, therefore, that any analysis of water resource distribution would not be complete without an understanding of the principal geologic structure of the study area.

Geologic mapping was necessarily of a reconnaissance nature, particularly in the western third of the county where vegetative cover limits outcrop and obscures structural relationships. Special attention was given to the Goldendale-Centerville area because of the relatively high ground-water use in that area. Field mapping revealed that in most of the county, orientation of the major structures is in one of two dominant directional groups. One group has a predominant east-west trend, while the other group is oriented northwest-southeast. Major structural features are shown on Plates IV and V, cross sections are presented in Plate VI, and a discussion of the two general groups follows.

East-West Structures

The northern and southern boundaries of Klickitat County are generally defined by major anticlinal structures. The Horse Heaven anticline to the north and the Columbia Hills anticline to the south, form topographically prominent ridges which extend along much of the county's margin. The Horse Heaven anticline forms a linear ridge, the crest of which is the southern boundary of the Yakima Indian Reservation. The fold is broad and asymmetrical, with the steeper flank to the north. The southern flank of the anticline forms a gently sloping dip surface which underlies much of the county. The western part of the anticline first appears in a northeast-southwest trending ridge which begins near Gilmer Flat and extends along the south side of Camas Prairie. Just east of the intersection of the Klickitat River and the anticlinal axis, the strike of the structure becomes more easterly with the anticlinal crest creating much of the relief of the Simcoe Mountains north of Goldendale. East of the Satus Pass area the structure plunges to the east and near Bickleton the primary axial element dies out. However, north of this plunging axis another anticlinal axis develops and carries to the northeast out of Klickitat County. This new anticlinal axis forms the extension of the Horse Heaven anticline east of Klickitat County. The two axes are separated by a synclinal valley, north of Bickleton, in which Pine Creek flows.

To the south, the Columbia Hills anticline follows much the same trend as the Horse Heaven structure. The westernmost exposure of the Columbia Hills anticline within the county is on the north side of the Columbia River gorge near Lyle. The anticline is breached by the Columbia River here, where it was originally recognized and named the Ortly anticline by Williams in 1916 (see Figure 21). To the northeast the trend of the anticline becomes more easterly and parallels the Columbia River valley. Like the Horse Heaven structure to the north, parts of the Columbia Hills anticline appear to die out but are replaced by similar-trending structures in the area east of Rock Creek. The eastern continuation of this structural trend has been called the Alder Ridge anticline by Newcomb (1971).

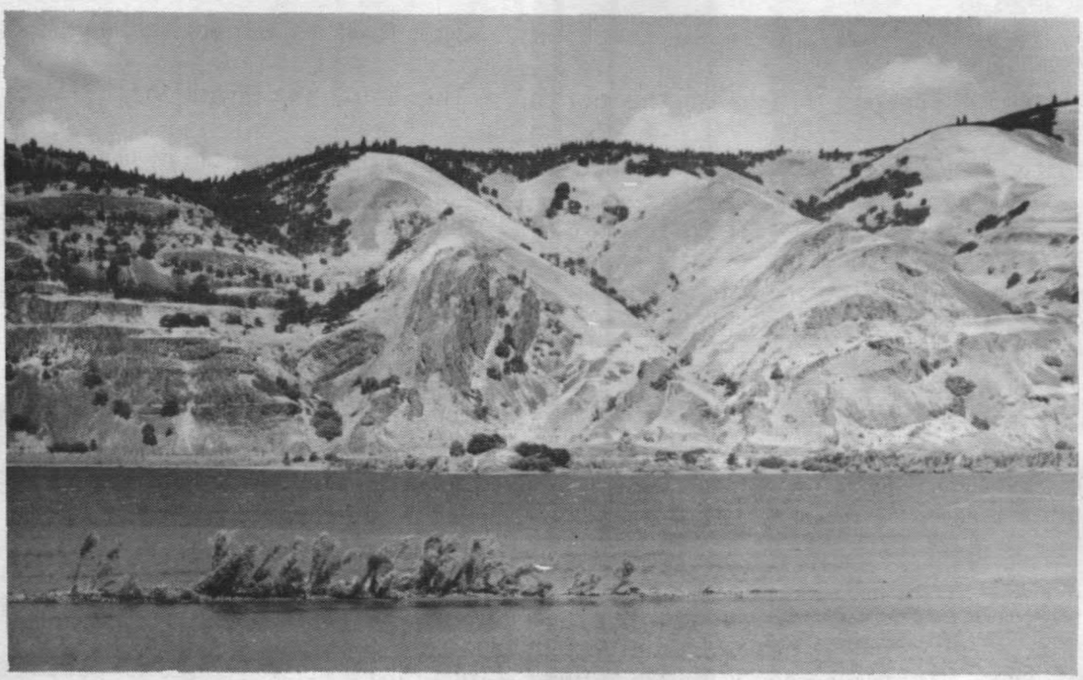

FIGURE 21. Columbia Hills anticline near Lyle, Washington.

The Columbia Hills anticline is much steeper than the Horse Heaven structure, particularly on its south flank south of Goldendale. The steepness of this southern flank led Hodge (1931) to suggest faulting rather than folding as the cause of the Columbia Hills. However, subsequent work (Newcomb, 1969) has shown it to be primarily a folded structure although there is probably substantial faulting associated with it.

Lying between the Columbia Hills and Horse Heaven anticlines is the Swale Creek syncline. The syncline is asymmetrical with its axis located at the base of the steeply-dipping north flank of the Columbia Hills anticline. South of Centerville the synclinal axis forms a natural trough in which Swale Creek flows. The syncline parallels the Columbia Hills structure, and near the intersection with Rock Creek the synclinal axis is offset in a manner similar to the Columbia Hills anticline.

Throughout much of the county there are smaller structures with trends and character similar to the major east-west structures. Between the Swale Creek and Little Klickitat River valleys is a broad, flat anticline to which Luzier applied the name Horseshoe Bend anticline. The structure is apparent for only a few miles and it plunges out to the northeast near the southwest corner of Goldendale. A shallow syncline parallels the anticline to the north. Similarly, between Bickleton and Cleveland in the eastern part of the county, a small anticline is present which parallels the Horse Heaven structure to the north. This small anticline appears to plunge beneath the surface at the edge of the town of Bickleton. The presence of these smaller structures is not particularly surprising as the major stresses that resulted in the formation of the Horse Heaven Hills and Columbia Hills likely produced many smaller, similar-trending features throughout the county.

Near the west end of the county, deformation becomes more severe and the presence of these minor structures is more apparent. In the southwest portion of the county several folds are present, the strike of which parallels the strike of the western extension of the Horse Heaven and Columbia Hills anticlines. These structures include the Bingen anticline, the Mosier syncline and an unnamed syncline which is occupied by Rattlesnake Creek, east of Husum. Like similar structures to the east, the folds appear to plunge and disappear to the northeast, west of the Klickitat River canyon.

Northwest-Southeast Structure

Superimposed upon the major east-west structures in the county are a series of northwest-southeast trending folds which seem to occur with regularity throughout the central part of the county. These structures were first reported by Sheppard (1960), who noticed that several of the Simcoe Mountain volcanic centers appeared to line up along northwest-southeast lineations. Associated with these lineations are a series of discriminate topographic protrusions which appear as small rounded domes on the gently dipping surface near the axis of the Swale Creek syncline. Although the domes appear to be isolated, they tend to occur along linear trends suggestive of some measure of integration. The domed features are most noticeable in the Columbia River basalt but also occur in the younger volcanics, generally near their southern margin. Sheppard (1960) attributed the structures to faulting and suggested that the topographically positive features associated with the lineations might be due to lava doming. Newcomb (1969) and Luzier (1969) later mapped several of these features and displayed them generally as inferred strikeslip faults.

In an effort to better define these features, flow-by-flow mapping was done in the Goldendale-Centerville area. The specific basalt flows involved are the uppermost Frenchman Springs, the Roza, and the Priest Rapids members. Mapping revealed that the central part of these domed structures was Frenchman Springs basalt and that the center was surrounded by progressively younger flows. In areas along the lineation where no topographic variation existed, the surface flow, generally Roza or Priest Rapids, was found to extend uninterrupted across the projected trend of the lineation. With a single exception, no direct evidence of faulting was found. The exception is in a small quarry in the NW 1/4 of Section 31, T. 4 N., R. 16 E, near the base of one of these domal features, locally referred to as Snipes Butte. In the quarry wall a 2-foot wide gouge zone is present. The zone cuts the uppermost Frenchman Springs flow but no evidence of vertical offset could be found. The lack of discernible offset and the size of the fault zone suggest that it may be a minor fault of a release nature associated with folding of the butte. Mapping in the area of Warwick, for which the Warwick fault (Newcomb, 1969) is named, produced no direct evidence of faulting; however, the topographic prominences strongly indicate folding. Study of the Goldendale fault (Luzier, 1969) resulted in a similar conclusion. Accordingly, the structures are shown as folds on Plates IV and V. Because the structures appear to exhibit a degree of linearity, the small domes are connected with a dashed line to indicate the general trend of the lineament.

The presence of linear trends of small disparate folds is not restricted to the immediate Goldendale area. East of Goldendale topographically prominent Luna Butte appears to be on a similar line of such features. East of Rock Creek a similar lineament connects a series of topographically prominent buttes which includes Quartz and Harrison buttes. Regional mapping (Shannon

& Wilson, Inc., 1973) suggests that lineament may extend south across the Columbia River into Oregon where it is known as the Arlington-Shuttler Butte lineament. East of this lineament, similar features do not appear to be present and the gently-dipping south limb of the Horse Heaven anticline does not show secondary structures with a northwest-southeast lineation. West of the Klickitat River, similar folded lineations are not apparent. However, the area is heavily forested and topographically rugged so such features are less likely to be apparent. Sheppard (1967) did infer the presence of several faults associated with stream drainages near Husum which have a similar northwesterly trend.

Age of Deformation

The actual age and relationship of structural deformation in this area are not well known. Basalts of the Columbia River Group appear to be folded in the major east-west structures and are unconformably overlain by the younger volcanics. This relationship would suggest that the major folding must have taken place in the interim. Absolute dates for the younger volcanics, obtained by Shannon and Wilson, Inc. (1973), range from 4.0 to 0.03 million years, which would suggest that the major east-west folds may have developed in the Pliocene. Whether the northwest-southeast structures developed at the same time is not known; however, the younger volcanics are implicated in the folding in at least two places and there is evidence which indicates the structures may have been involved in two separate stages of folding. These data suggest that development of the northwest-southeast structure may have been contemporaneous with the east-west ones and that further folding of these northwest-southeast structures took place after the extrusion of the younger volcanics.

Geology

Geologic History

From the relationship of geologic units within Klickitat County and information about similar units from other areas of Washington and Oregon, a general geologic history can be inferred.

The geologic record prior to Tertiary time is unknown. However, the presence of Eocene volcaniclastics along the western edge of the county and in the Cascade Mountains indicates abundant extrusion of volcanics during the early Tertiary. The nature of the extrusive material indicates that it was deposited under water, probably in inland lakes.

Following this early Cascade volcanism, fissure eruptions occurred in the Columbia Plateau area and great volumes of basalt of the Columbia River Group were extruded over much of what is now eastern Washington and Oregon. During the later stages of Columbia River basalt extrusion, some structural deformation and increased Cascade volcanic activity are evidenced in the areal restriction of the later basalt flows and the increase in interbedded tuffaceous sediments.

As the Columbia River volcanism decreased, Cascade volcanism apparently increased and a large amount of pyroclastic debris was distributed eastward and southward from the Cascades. Toward the end of this renewed Cascade volcanism much of the major structural deformation was apparently beginning, which ultimately resulted in formation of many of the east-west structures east of the Cascades and some of the northwest-southwest structures. Contemporaneously with this deformation, streams began to establish their present drainage patterns.

Following the major period of deformation, renewed volcanism covered parts of the county with younger basalts and andesites, culminating in the extrusion of the recent Mt. Adams volcanics. Concomitant with Simcoe Mountain and recent volcanism, renewed structural deformation along a northwest-southwest orientation was also developed.

SURFACE-WATER RESOURCES

Introduction

Although a discussion of surface water resources normally includes standing bodies of water, the virtual absence of lakes and man-made reservoirs within Klickitat County limits consideration to rivers and streams.

Discussion of surface waters is divided into three major sections. First a brief overview of the county's surface water is presented, followed by a presentation of relevent data. Finally, the data are discussed for each of the major drainage basins.

General Characteristics

Like its climate, the county's surface-water resources exhibit considerable variation from east to west. These variations facilitate categorizing the major streams into three general types. Streams in the eastern half of the county are intermittent. When flowing, these streams normally display low daily discharges, but discharges may vary over several orders of magnitude for a limited duration. Discharge variation is a function of the high runoff potential of the land surface in the drainage basins. The variation produces flashy streams characteristic of an arid or semiarid climate. Streams of this type derive from direct runoff and flow only during high-precipitation months.

A second type of stream present in Klickitat County is the perennial stream. This type commonly has a very low discharge throughout the year but annual discharge variation is less dramatic than that of the first type. The stream source is also direct runoff; however, some of the precipitation is retained in the form of snowpack which produces a more gradual release during spring and early summer. Differences between peak runoff and low flow are more gradational than in streams of the first category, indicating a substantial contribution from bank and basin storage. Streams in the central part of the county, particularly the Little Klickitat River, are streams of this type.

Streams in the western part are representative of a third stream type. This type is characterized by streams having little discharge fluctuation throughout the year and having a higher ratio of discharge to drainage area than either of the other two types. Streams of this type are fed by direct runoff; however, much of the precipitation is captured in the form of snow at higher elevations, and gradual melting coupled with ground-water discharge sustains a relatively high flow throughout the year. Streams of the third type are, of course, most desirable as irrigation sources because of their sustained flow through the low-precipitation months.

Basic Stream Flow Data

Most of the quantitative information on surface-water resources is in the form of stream discharge measurements. The measurements provide a measure of the flow of a stream past a given point. Within Klickitat County, three types of stream measurements have been made. The most complete data are acquired with a continuously recording gaging station. At such a station, discharge information is recorded continually (generally graphically) providing an uninterrupted record of the stream flow. Because the discharge of a stream varies continually, the daily discharge is normally presented as the mean for a given 24-hour period. Evaluation and presentation of gaging station information in this report is based on mean daily discharge unless otherwise noted.

Other types of stream measurement include miscellaneous discharge measurements and crest-stage measurements. Miscellaneous measurements are instantaneous measurements made by field personnel at selected locations on streams. These measurements provide instantaneous discharge values and furnish flow information on streams lacking continuous recording stations or at ungaged locations on gaged streams. Crest-stage measurements record the maximum discharge of a stream during selected time periods through the mechanism of a high water mark on a calibrated gage. Crest-stage measurements provide only a maximum discharge value.

All streamflow information used in this report was collected by the U. S. Geological Survey as part of a program to obtain information on the nation's surface-water supplies. Crest-stage and miscellaneous discharge measurements made within the county and in the upper Klickitat River basin are presented in Appendix A. Locations of the recording sites are shown on Plates I, II, and III.

Bar Chart of Stream Gaging Stations

The period of record for all stations within Klickitat County and in the upper Klickitat River basin, for which continuous discharge records are available, is presented in Figure 22. Included in Figure 22 are the U. S. Geological Survey location numbers for each gaging station. The location numbers provide an abbreviated method of reference to a specific gaging station and are used to identify each station on Plates I, II, and III.

Figure 22 indicates that most gaging stations in the western half of the county have been operated in the White Salmon and Klickitat River drainages. For most of these stations, the period of operation was relatively short. The longest continuous record appears to have been made on the Klickitat

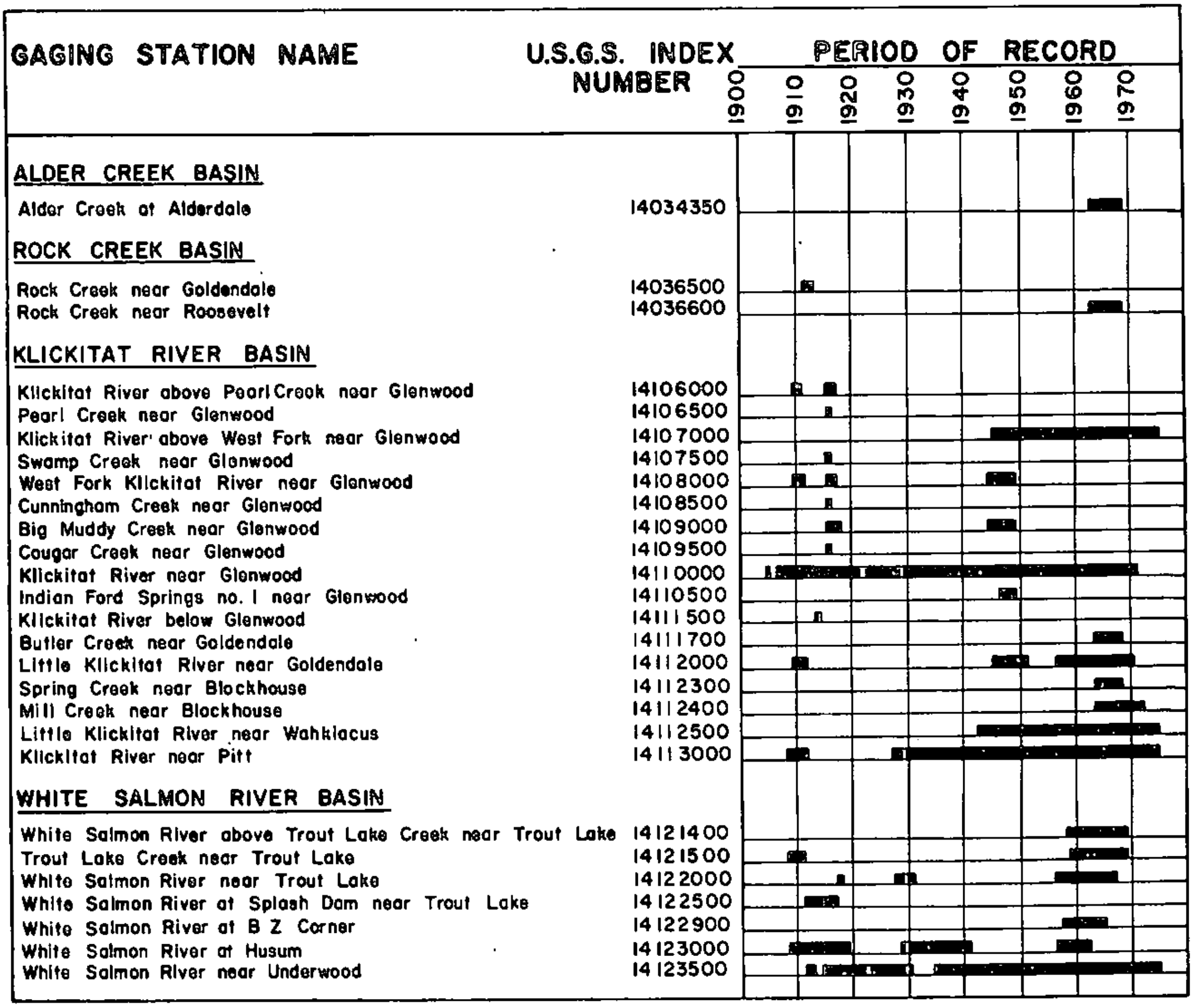

FIGURE 22. Bar chart of stream gaging station records, Klickitat County and upper Klickitat River basin, Washington.

River near Glenwood where measurements were begun in 1905 and discontinued in 1971. Gaging station records of the Klickitat River, near Pitt, and the White Salmon River, near Underwood, are also of considerable length.

Only three gaging stations have been operated in the eastern half of the county. The longest periods on record in this area are from 1963-1968 for stations on Alder Creek and Rock Creek. As these were the only stations with significant periods of record in the eastern part of the county, and because record periods overlap those of many stations in the western part, the six year interval, 1963-1968, is used for comparative purposes in this report.

While most of the gaging station records are short, the stations on the Klickitat River near Glenwood, and Klickitat River near Pitt, are of sufficient length to give an idea of long-term variations. Comparison of the average annual discharge at these stations with the moving precipitation averages from Goldendale furnish insight into the relationships between the quantities. Attempts to use records from these stations to generate synthetic discharge values for short record stations were not successful because of the extreme variation in stream character among basins.

Data Presentation

Basic stream gaging information was processed in a variety of ways and particular records were examined to analyze specific stream parameters. The limited period of record of many of the gaging stations resulted in only selected stations within the county and upper Klickitat basin being chosen for analysis. Choice of station was based on length of record, quality of record, and station location. The stations selected for analysis are listed in Table 2.

Data presented include a six-year mean daily discharge, maximum and minimum mean daily discharge, monthly maximum, minimum, and average discharge, discharge duration, and minimum discharge duration. A supplemental analysis of maximum discharge was made for selected gaging stations and is presented in the section on floods.

Most of the analyses are based on the entire usable period of record, but in the case of mean daily discharge, the selected six-year interval from

TABLE 2: Name and identification number of stream gaging stations selected for analysis, Klickitat County and upper Klickitat River basin, Washington.

Gaging Station	U.S.G.S. Location Number
White Salmon River near Trout Lake	14122000
White Salmon River near Underwood	14123500
Klickitat River above West Fork, near Glenwood	14107000
Klickitat River near Glenwood	14110000
Klickitat River near Pitt	14113000
Little Klickitat River near Goldendale	14112000
Little Klickitat River near Wahkaicus	14112500
Alder Creek at Alderdale	14034350
Rock Creek near Roosevelt	14036600

1963 to 1968 is used. Analysis of discharge duration is made for both the period of record and the six-year study period.

Six-Year Mean Daily Discharge

Mean daily discharge of each of the selected gaging stations is presented by means of a hydrograph -- a plot of discharge versus time -- which is useful in determining drainage basin characteristics, as the shape of an individual hydrograph reflects the nature of drainage basin parameters.

Because a hydrograph of a single year's discharge record may not be representative of the stream's normal characteristics, it is often useful to use a long-term hydrograph. To reduce the possibility of bias and to facilitate comparison among drainage basins within the county, a hydrograph of the six-year period 1963-1968 is presented for each station.

Maximum and Minimum Mean Daily Discharge

Hydrographs of the maximum and minimum mean daily discharge for the entire period of record have been prepared. These provide an estimate of the upper and lower limits of flow that might reasonably be expected. Longer stream gaging station records provide a more representative picture of the extremes.

Minimum, Maximum, and Average Monthly Discharge

In addition to daily minimums and maximums, monthly maximums, minimums and average discharges for each selected station are presented. Monthly data presentation is beneficial because the large time unit tends to smooth instantaneous discharge variations due to thunderstorms or minor freeze-ups and presents a more representative picture of the minimum, maximum, and average discharge that could be expected in any month.

Discharge Duration

Analysis of discharge duration (the percent of time that a given discharge was equaled or exceeded) is presented as a series of cumulative frequency curves. These curves are generally referred to as flow duration curves and are explained in detail by Searcy (1959). The curves provide a means of examining a stream's flow characteristics and, because of the nature of the curve, they are particularly useful in examining low flow characteristics. For the selected station within Klickitat County, two flow duration curves have been prepared, one of the six-year comparison period (1963-1968) and one for the entire period of record at each gaging station.

The flow duration curve is prepared by ranking mean daily discharge values according to their magnitude and determining the percent of time that a specified discharge was equaled or exceeded. Logarithmic discharge values normally are plotted on the ordinate versus a probability percentage distribution on the abscissa. A curve drawn through the plotted points represents the average condition for the period of record. Searcy (1959, p. 2) cautions that in the strictest sense the flow duration curve applies only to the period for which the data used to develop the curve are pertinent. He does allow, however, that if the streamflow during the period on which the flow duration curve is based represents the long-term flow of the stream, the curve may be considered a probability curve and used to estimate the percent of time that a specified discharge will be equaled or exceeded in the future.

Minimum Discharge Duration

An analysis of minimum streamflow, similar to flow duration, was also made. This low flow analysis was compiled by the U. S. Geological Survey in accordance with standards established by Riggs (1972). In the analysis, the lowest discharge occurring during the specified number of days at recurrence intervals varying from 1.01 to 100 years is determined. In most cases the 50- and 100-year low flows are a calculated projection based on the existing period of record.

Low flow analysis is useful because of the demand on surface-water resources during periods of low flow and for determining availability of water for impoundment and other hydraulic projects. Low flow analysis, like flow duration work, can be used in some cases to predict the probability of specified discharges in the future.

Discussion of Surface-Water Resources

Plates I and II (in pocket) outline the major drainage basins within Klickitat County and the principal streams within these basins. Plate III provides similar information for the upper Klickitat River basin in Yakima County. The location of stream gaging stations, as well as the location of miscellaneous discharge and crest-stage measurements, are indicated on these plates. Gaging station locations are shown in Figure 22. Miscellaneous and crest stage measurement locations are cross referenced to Tables A-1, A-2, A-3 in Appendix A. Miscellaneous measurement locations do not have an identification number and thus a simple consecutive numbering system is used in this report.

Because of the wide diversity in stream and drainage basin characteristics, surface-water resources are best discussed by individual drainage basin. For purposes of comparison, Table 3 summarizes pertinent information from principal gaging stations in the major drainage basins of the county. The summary includes drainage area, period of record, mean discharge for the period of record, and the dates and discharges of the instantaneous maximums and minimums.

Alder Creek Basin

Alder Creek drains an area of about 200 square miles in southeast Klickitat County (Plate II). The area drained extends from near Bickleton, in the northwestern part of the basin, to the extreme southeast corner of the county. Generally, Alder Creek and its principal tributaries, Six Prong Creek and Spring Canyon Creek, drain almost due south to the north side of Columbia Hills and Alder Ridge. From there, the creek courses eastward along the axis of the syncline (Plate V) to where it breaches the Alder Ridge-Columbia Hills anticline near the southeast corner of the county and discharges into the Columbia River.

TABLE 3. General information from selected stream gaging stations, Klickitat County and upper Klickitat River basin, Washington.

Station No. (USGS)	Station Name	Location	Drainage Area (Mi^2)	Period of Record
14034350	Alder Creek at Alderdale	NE4, SW4, Sec. 10, T. 4 N., R. 23 E., on left bank, 1 mile upstream from mouth.	197.0	1963-1968
14036600	Rock Creek near Roosevelt	W2, NE4, Sec. 16, T. 3 N., R. 19 E., on left bank on down-stream side of county road bridge.	213.0	1963-1968
14107000	Klickitat River above West Fork near Glenwood	NW4, SW4, Sec. 18, T. 9 N. R. 13 E., on right bank, 17 miles, north of Glenwood.	151.0	1944-1975
14108000	West Fork Klickitat River near Glenwood	SE4, Sec. 14, T. 9 N., R. 12 E., on right bank at road bridge, 2 miles upstream from mouth.	89.0	1910, 1916, 1944-1948
14110000	Klickitat River near Glenwood	SE4, Sec. 14, T. 7 N., R. 12 E., on left bank, 5.2 miles north of Glenwood.	360.0	1905, 1907, 1908, 1909-1971
14112000	Little Klickitat River near Goldendale	NE4, SW4, Sec. 10, T. 4 N., R. 16 E., on right bank, 400 ft. upstream from Highway 97 bridge.	83.5	1910-1912 1946-1951, 1957-1970
14112400	Mill Creek near Blockhouse	NW4, SW4, Sec. 5, T. 4 N., R. 15 E., on left bank, 1.9 miles northwest of Blockhouse	26.9	1966-1972
14112500	Little Klickitat River near Wahkaicus	SW4, SE4, Sec. 9, T. 4 N., R. 14 E., on right bank, 450 ft. upstream from State Highway 142 bridge.	280.0	1944-1975
14113000	Klickitat River near Pitt	SW4, Sec. 8, T. 3N. R. 13 E., on left bank, 2.8 miles south of Pitt.	1297.0	1909-1912, 1928-1975

Mean Discharge for Period of Record (cfs)	Minimum (cfs)		Maximum (cfs)	Date	Basin Runoff cfs/Mi^2
8.51	0.20	July 25, 1963 June 26-July 11, 1968 July 28-July 30, 1965	17,600	Dec. 22, 1964	0.04
45.80	0.0	Many days	14,200	Dec. 22, 1964	0.22
336.00	4.4	Feb. 1, 1954	3,280	May 27, 1948	2.23
304.00	148.0	Oct. 17-Oct. 19, 1945	1,560	May 26, 1948	3.42
841.00	204.0	Nov. 28, 1931	9,870	Dec. 22, 1933	2.34
60.10	0.0	Aug. 21, 1967 Sept. 4, 5, 1967	5,200	Dec. 22, 1964	0.72
15.80	0.1	Aug. 14, 16, 18, 23, 24, 25, 1965	290	Dec. 23, 1964	0.59
182.00	9.7	Sept. 7, 8, 1973	17,500	Jan. 15, 1974	0.65
1630.00	445.0	Dec. 17, 1964	47,400	Jan. 15, 1974	1.26

TABLE 3 (Cont'd)

Station No. (USGS)	Station Name	Location	Drainage Area (Mi^2)	Period of Record
14121400	White Salmon River above Trout Lake Creek near Trout Lake	SE4, SE4, Sec. 3, T. 6 N., R. 10 E., on right bank, 2.2 miles north of Trout Lake.	64.9	1959-1969
14121500	Trout Lake Creek near Trout Lake	SE4, SW4, Sec. 15, T. 6 N., R. 10 E., on right bank, 0.4 miles downstream from Trout Lake.	69.3	1909-1911, 1959-1969
14122000	White Salmon River near Trout Lake	NW4, SE4, Sec. 24, T. 6 N., R. 10 E, on left bank, 1.7 miles southeast of Trout Lake.	185.0	1918, 1928-1931, 1957-1967
14122500	White Salmon River at Splash Dam near Trout Lake	E2, Sec. 6, T. 5 N., R. 11 E., on right bank at Splash Dam, 5 miles southeast of Trout Lake.	240.0	1912-1917
14122900	White Salmon River at B-Z Corner	NW4, SW4, Sec. 1., T. 4 N., R. 10 E., on left bank, 0.8 miles north of B-Z Corner.	269.0	1958-1965
14123000	White Salmon River at Husum	SW4, SW4, Sec. 30, T. 4 N., R. 11 E., on right bank at Husum.	294.0	1909-1919, 1929-1941, 1957-1962
14123500	White Salmon River near Underwood	NW4, NW4, Sec. 14, T. 3 N., R. 10 E., on right bank, 1000 ft. downstream from Pacific Power & Light Co.'s Conduit Power Plant.	386.0	1912-1913, 1915-1930, 1935-1975

Mean Discharge for Period of Record (cfs)	Minimum (cfs)		Maximum (cfs)	Date	Basin Runoff cfs/Mi^2
237.00	98.0	Mar. 4, 1966	1,080	Dec. 23, 1964	3.65
264.00	26.0	Sept. 12, 13, 1963	2,900	Dec. 23, 1964	3.81
382.00	35.0	Aug. 26, 1931	3,860	Nov. 20, 1962	2.06
443.00	52.0	Aug. 1, 4-6, 1915	2,160	Apr. 3, 1915	1.85
791.00	287.0	Oct. 4, 5, 1963	3,830	Nov. 20, 1962	2.94
980.00	340.0	Dec. 30, 1930	10,800	Dec. 22, 1933	3.33
1140.00	158.0	Jan. 17, 1950	15,300	Jan. 15, 1974	2.95

One gaging station was operated near the mouth of Alder Creek from 1963-1968. No diversions existed above the gaging station, and aside from general stock watering, there has been little use. Most of the area within the basin is not irrigated so there is little contribution to the natural flow from irrigation return flow.

Field observation and conversation with area residents indicate that all streams within the basin are intermittent, flowing only during periods of snowmelt or heavy precipitation. The six-year and maximum-minimum hydrographs (Figures 23 and 24) prepared from gaging station data, however, indicate flow is sustained through the year, because flow was measured

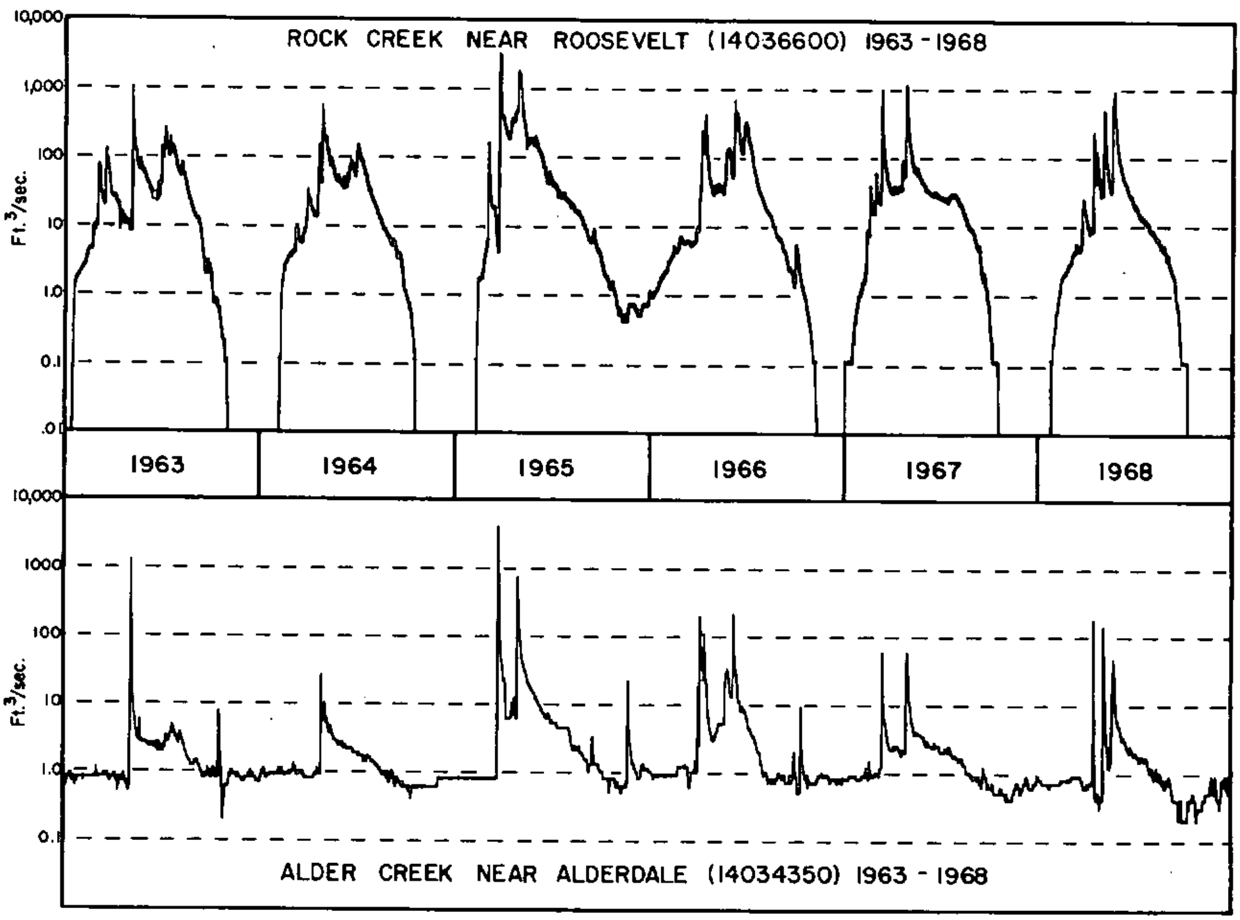

FIGURE 23. Mean daily discharge for Rock Creek and Alder Creek, Klickitat County, Washington.

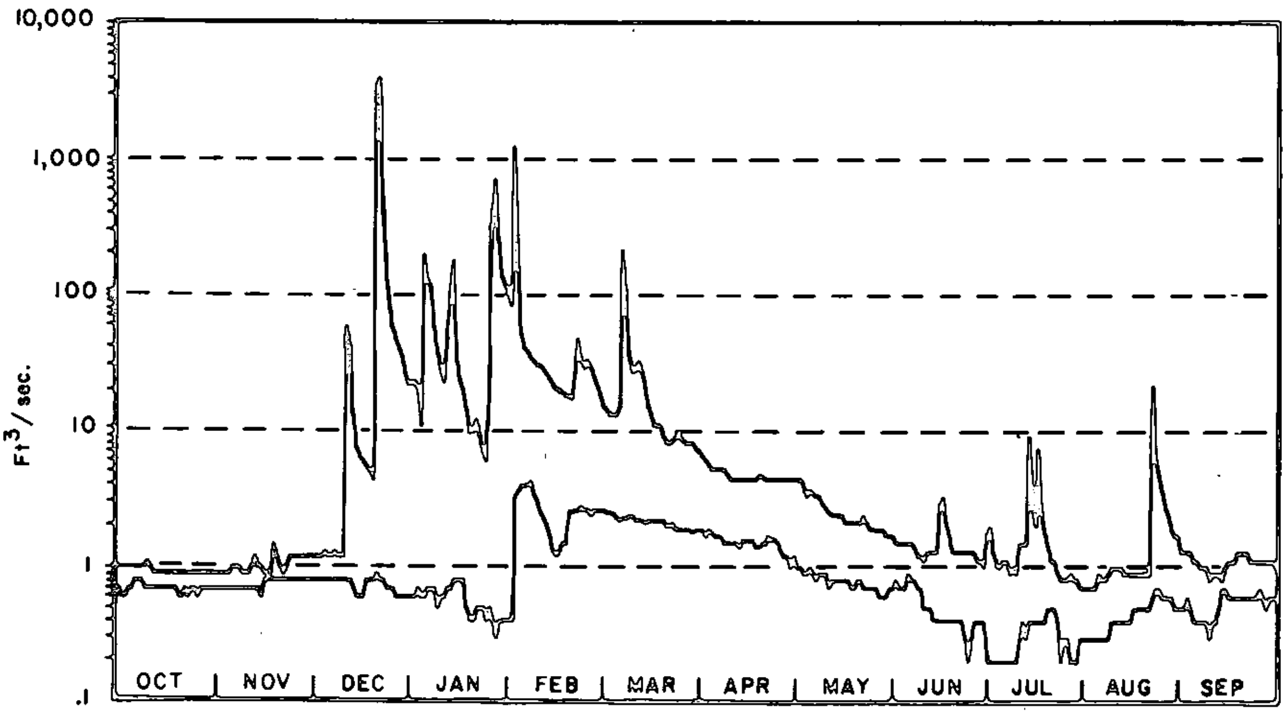

FIGURE 24. Maximum-minimum discharge (1963-1968), Alder Creek at Alderdale Washington.

immediately downstream from a perennial spring (5/23-34Q1s) in Alder Creek canyon. The spring provides a relatively constant discharge of about 0.8 cfs which can be used as an approximate baseline in interpreting the hydrographs.

The hydrographs indicate the "flashy" nature of the streams in eastern Klickitat County. The very steeply rising limb on both of the six-year and maximum hydrographs indicate rapid concentration of direct runoff from high-intensity precipitation. Recession flows are similarly steep, indicating immediate runoff with relatively little contribution from bank storage. Also indicative of rapid runoff is the wide variation in discharge during a year. Figure 25 shows the monthly maximum discharge to be 8500 cfs for December, in contrast to a discharge of near 0 for May through November. The discharge variation is further evidenced by the flow duration curves (Figure 26) which indicate widely varying discharges occurring 30 percent of the time. The near horizontality at the lower end of the flow duration curve is in response to the sustained flow from the nearby spring.

Alder Creek Basin can be considered typical of many drainage basins in arid and semiarid areas. The areas normally have steep gradients and sparse vegetation which results in rapid runoff from precipitation. Streams in these areas are normally intermittent, but when flowing, often exhibit high flows over several orders of magnitude. The intermittent nature of the streams and the very rapid runoff suggest little contribution from basin storage in these areas.

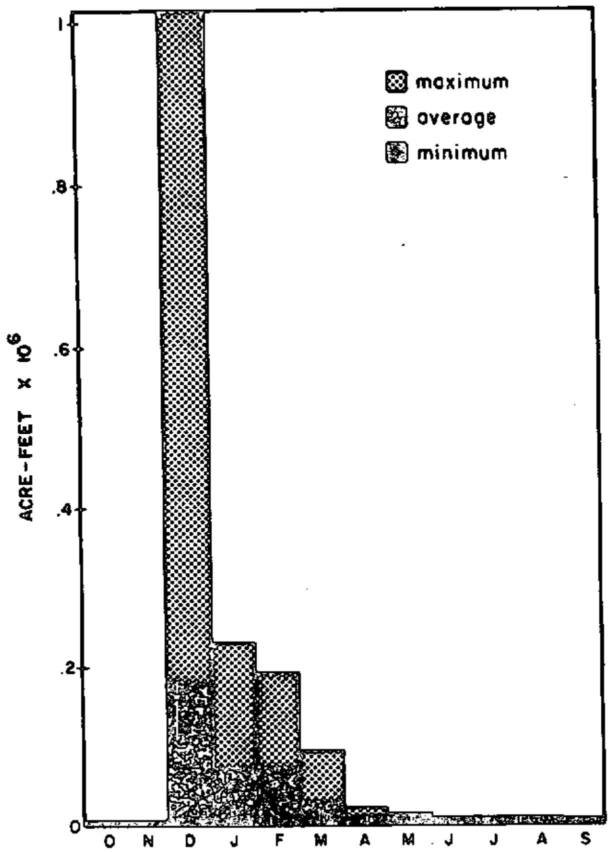

FIGURE 25. Maximum, minimum and average monthly discharge, 1963-1968, Alder Creek at Alderdale, Washington.

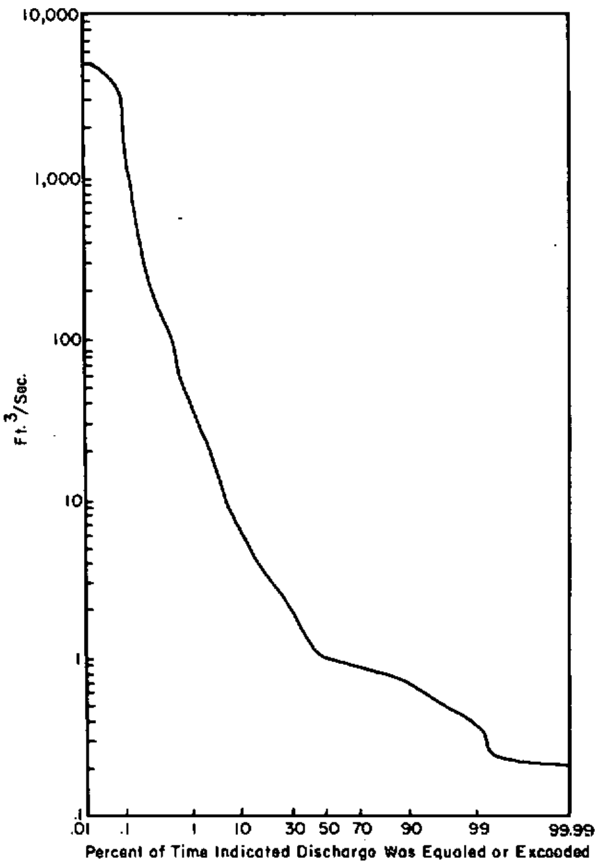

FIGURE 26. Flow duration, 1963-1968, Alder Creek at Alderdale, Washington.

Surface-water Resources

Rock Creek Basin

The Rock Creek basin occupies an area of slightly more than 200 square miles. It is situated in the east-central part of the county and forms a large circular basin with a well-developed dendritic drainage pattern. The basin drains an area extending from the Horse Heaven Hills to the Columbia River. It is bounded by Luna Butte on the west and an indefinite topographic divide between tributaries of Harrison and Squaw Creek and Wood Gulch on the east (Plate II). Mean annual precipitation within the basin varies between 15 and 25 inches, with the greater amount falling in the northern and western areas of the basin.

Two gaging stations have operated in the Rock Creek basin (Figure 22). The station near Goldendale was operated for a year and a half in 1912 and 1913. The gaging station near Roosevelt (see Plate II), located near the mouth of Rock Creek, was operated for the six-year period 1963-1968. No major diversions or withdrawals are made above the gaging station.

Mean annual precipitation is greater in Rock Creek basin than in Alder Creek basin. This produces differences in runoff which can be easily recognized by comparing hydrologic data from the two basins. Rock Creek basin has only a slightly larger area than Alder Creek basin. However, for the same period of record, the average discharge of Rock Creek was more than five times that of Alder Creek (Table 3). Nevertheless, the instantaneous maximum discharge, which occurred on the same day for each station, was 3400 cfs less for Rock Creek than Alder Creek. This comparison suggests that, although the Rock Creek basin receives more precipitation, a smaller percentage of it occurs as direct runoff than in the Alder Creek basin. Apparently, bank storage is a more significant contributor to the flow of Rock Creek.

Comparison of six-year and maximum-minimum hydrographs for the two stations reflect the differences between the two basins. The rising limbs on both hydrographs of Rock Creek, though steep, are not as abrupt as those of Alder Creek. Similarly, the recession limbs are more gradual. In general, runoff in Rock Creek basin appears less direct and instantaneous than in Alder Creek basin.

Comparison of flow duration curves for the two stations (Figures 26 and 28) indicates that maximum discharges are of the same order of magnitude. Flow in Rock Creek, however, is sustained at a much higher level for 70 percent of the time than is that of Alder Creek. This relationship is also apparent in the hydrographs of monthly maximum and average discharge at the two stations (Figures 25 and 29).

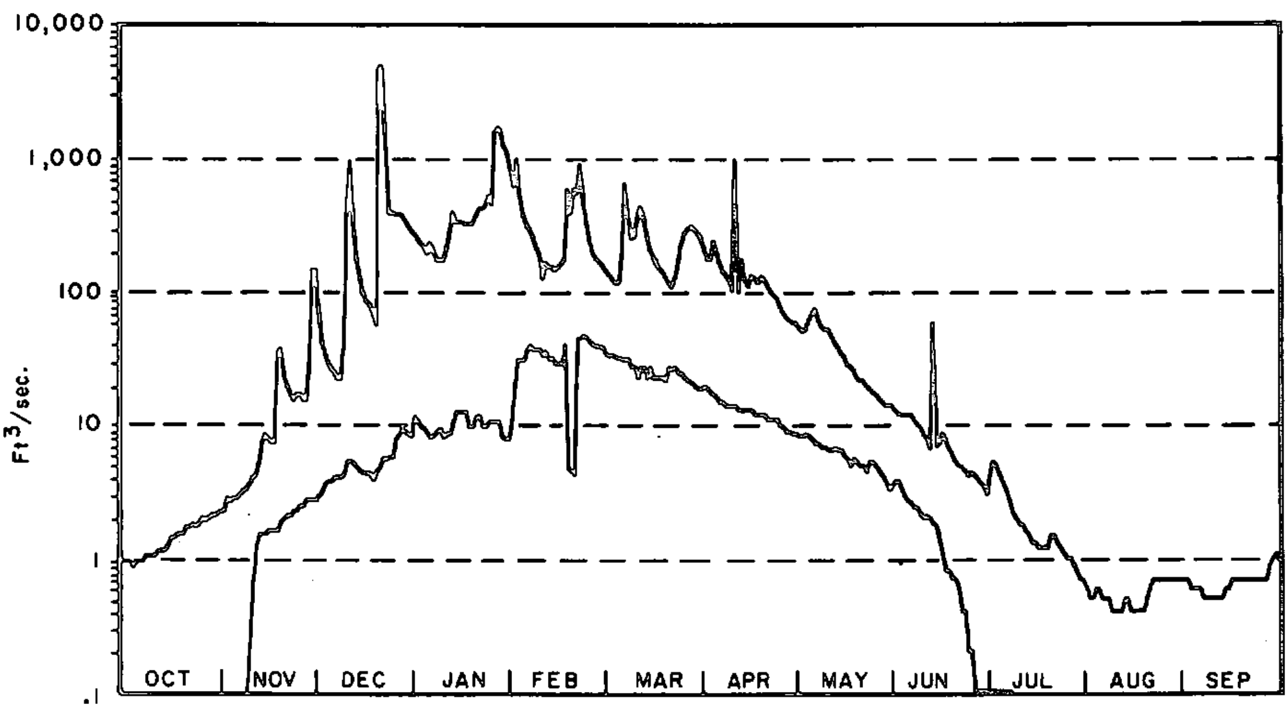

FIGURE 27. Maximum-minimum discharge (1963-1968), Rock Creek near Roosevelt, Washington.

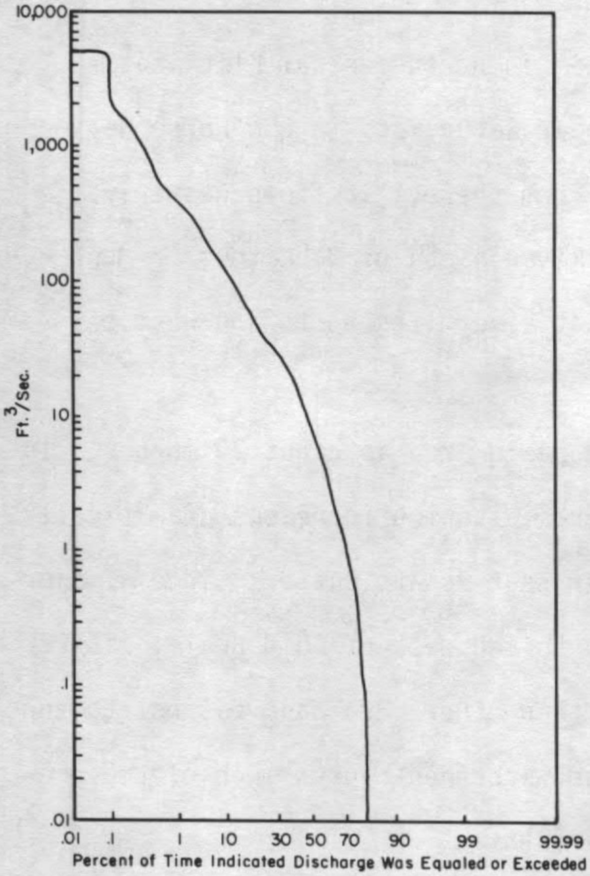

FIGURE 28. Flow duration, 1963-1968, Rock Creek near Roosevelt, Washington.

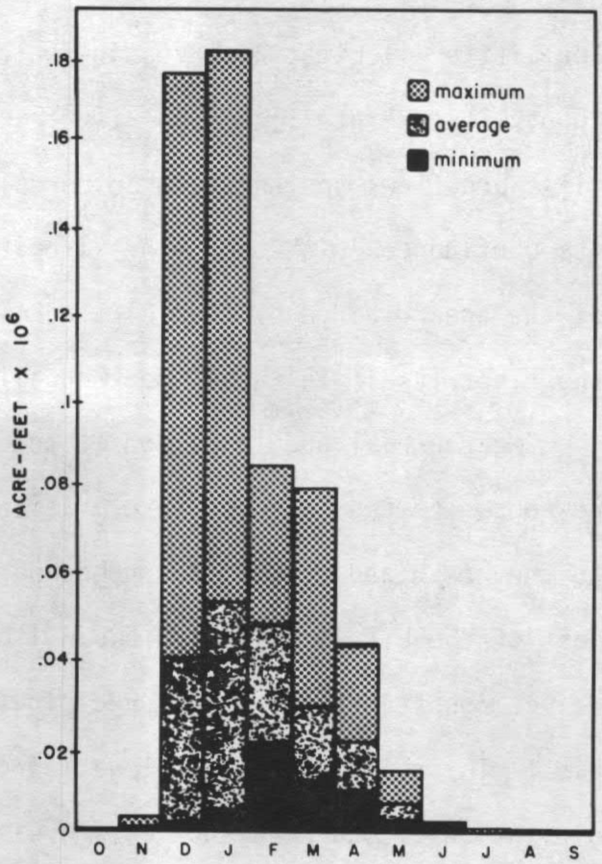

FIGURE 29. Maximum, minimum, and average monthly discharge, 1963-1968, Rock Creek near Roosevelt, Washington.

Klickitat River Basin

The Klickitat River basin is the largest drainage basin in Klickitat County, having an area of over 1300 square miles. This basin includes approximately 400 square miles in western Yakima County as well as most of central Klickitat County, including subsidiary drainage basins of Little Klickitat River and Swale Creek. In the following discussion the Little Klickitat River and upper Klickitat River basins are discussed separately.

Little Klickitat River Basin

The Little Klickitat River basin is located in north-central Klickitat County (see Plate I). The river rises near Satus Pass in the Horse Heaven Hills and flows southwest to Goldendale. From there, it flows westerly to its confluence with the main Klickitat River north of Wahkaicus. Most of the area drained by the Little Klickitat River lies north and west of the river itself in the Simcoe Mountains.

Mean annual precipitation in the Goldendale area is about 20 inches. In response to the increase in elevation, precipitation increases dramatically to the north and reaches 35 inches per year near Potato Butte. Since a major part of the Little Klickitat basin lies north and west of Goldendale, it receives substantially more precipitation than other drainage basins to the east. The relatively high elevation of the watershed causes much of the precipitation to occur as snow during winter months.

Two principal gaging stations have been operated on the Little Klickitat River. One station, just north of Goldendale, was maintained intermittently and the other is still operated near the mouth of the Little Klickitat River, just north of Wahkaicus (see Plate I). In addition, several short-term stations have been established on tributaries to the Little Klickitat River (see Figure 18). The station near Goldendale began operation in 1910 but was maintained for only one year. The station subsequently operated intermittently from 1947-1970. The station near Wahkaicus has been operated continuously since 1947. No major diversions exist on the Little Klickitat River; however, at numerous locations along its course water is withdrawn for irrigation purposes. Unregulated discharge into the Little Klickitat River from the Goldendale sewage treatment plant is estimated to be about 2 cfs.

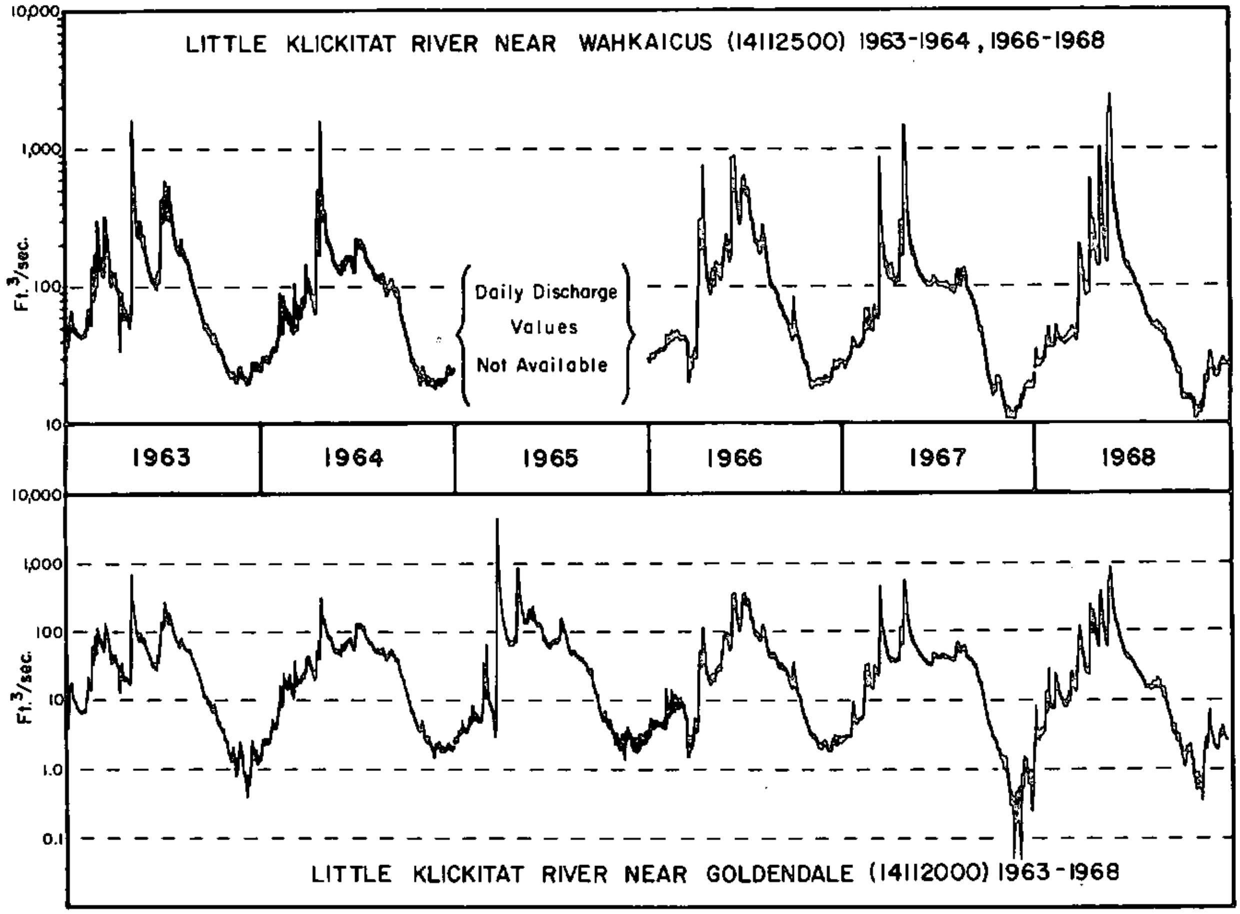

FIGURE 30. Mean daily discharge, Little Klickitat River, Klickitat County, Washington.

Comparison of hydrologic data for the Little Klickitat River basin with the Rock Creek and Alder Creek basins reveals the result of increased precipitation within the Little Klickitat basin. The gaging station at Goldendale, although measuring discharge from a drainage area less than half as large as the Rock Creek station, shows an average discharge which exceeds that of Rock Creek by 15 cfs (Table 3). Similarly, basin runoff of the Little Klickitat River near Goldendale is more than three times that of Rock Creek. A decrease in basin runoff contribution is evident between the gaging stations near Goldendale and Wahkaicus. This difference occurs because the station

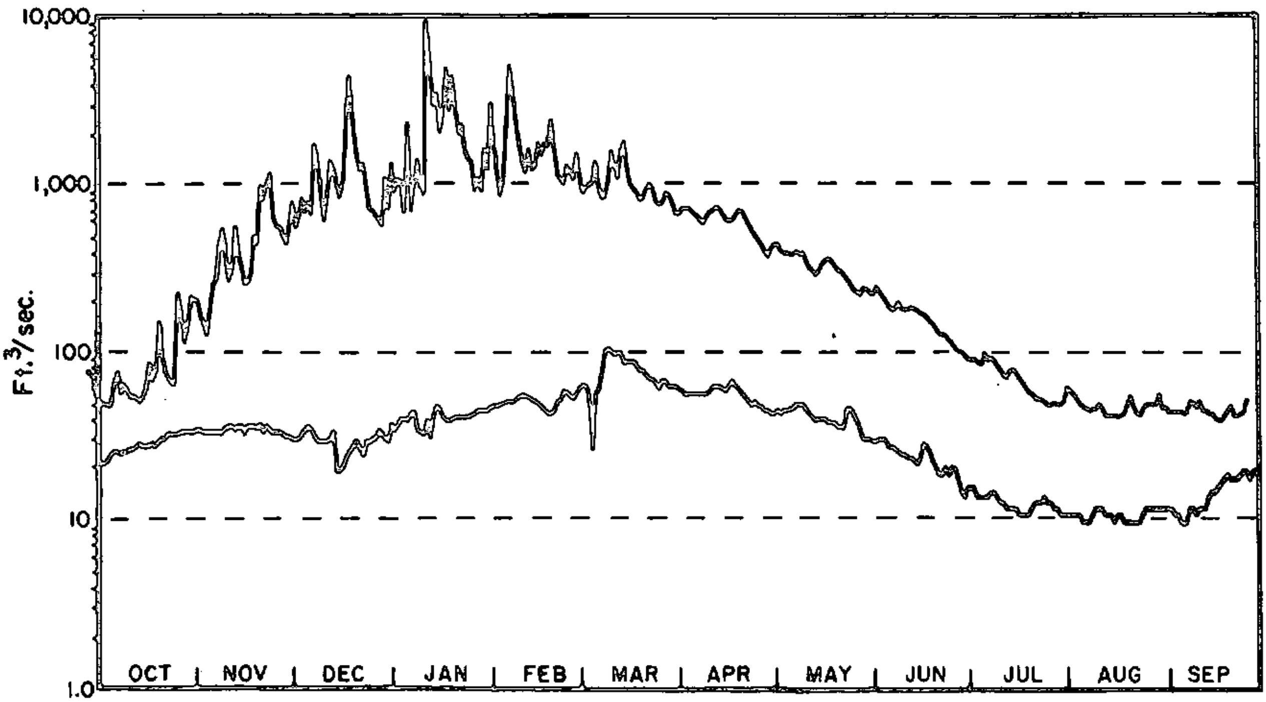

FIGURE 31. Maximum-minimum discharge, 1950-1975, Little Klickitat River near Wahkaicus, Washington.

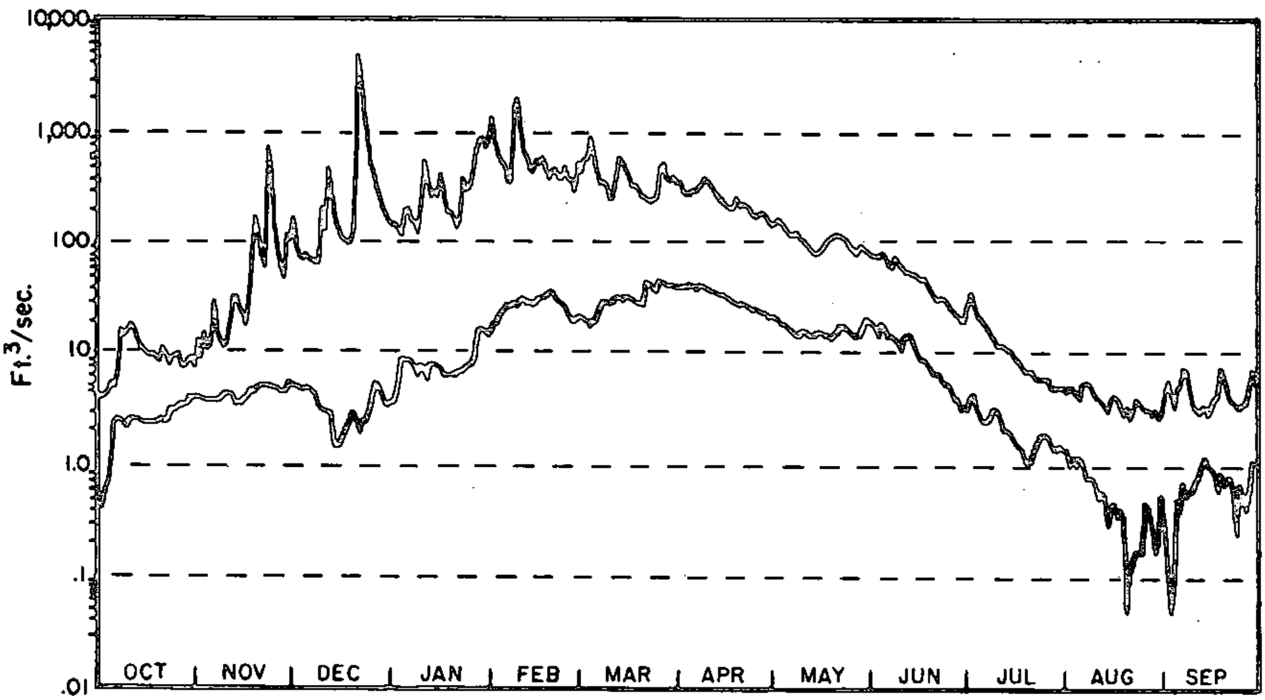

FIGURE 32. Maximum-minimum discharge, 1958-1970, Little Klickitat River near Goldendale, Washington.

near Goldendale gages the upper watershed where precipitation is relatively high, while the station near Wahkaicus includes contributions from the southern part of the drainage basin where precipitation is much lower.

Comparison of flow duration curves for the two stations on the Little Klickitat River (Figures 33 and 34), also reflects the differences in watershed. Although minimum discharges at both stations are of the same order of magnitude, the slope of these curves at the lower ranges of flow are considerably different. Much of the difference may be attributed to contributions from Mill Creek which maintains a relatively constant discharge of about 15 cfs the year-round because of its springfed sources.

Upper Klickitat River Basin: Much of the Klickitat River's discharge is derived from its upper watershed located in western Yakima County. This basin (see Plate III) has an area of about 400 square miles and is located on the rugged eastern slope of the Cascade Mountains. Mean annual precipitation is highest on the slopes of Mt. Adams, often in excess of 100 inches.

Information is available from two stream gaging stations in the upper Klickitat River basin (Figure 22). One station is located above the confluence of the Klickitat River and its west fork. The other was operated for 62 years on the Klickitat River just north of the Yakima-Klickitat County line (see Plate III). There is no diversion above the station near West Fork; however, diversion of tributaries into the Klickitat River above the lower station is effected via Hellroaring Ditch. Water is normally diverted from June until the end of October and is estimated to total between 10,000 and 20,000 acre-feet per year (Cline, 1976).

Six-year hydrographs for the two gaging stations in the upper Klickitat basin are unusually similar (Figure 37). This similarity relates to the fact

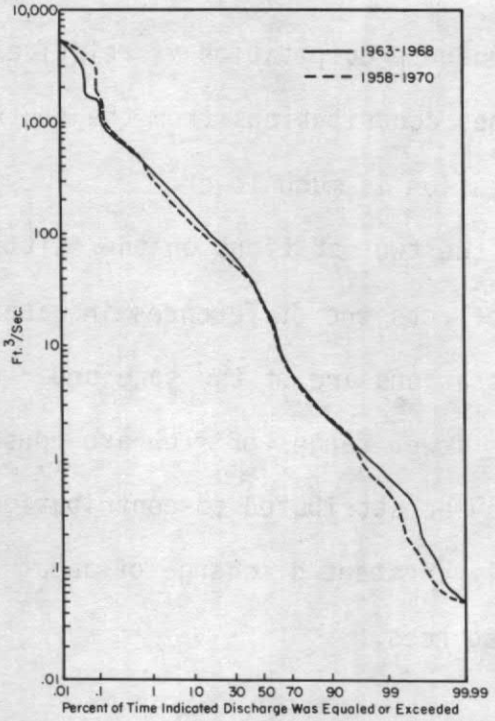

FIGURE 33. Flow duration, Little Klickitat River near Goldendale, Washington.

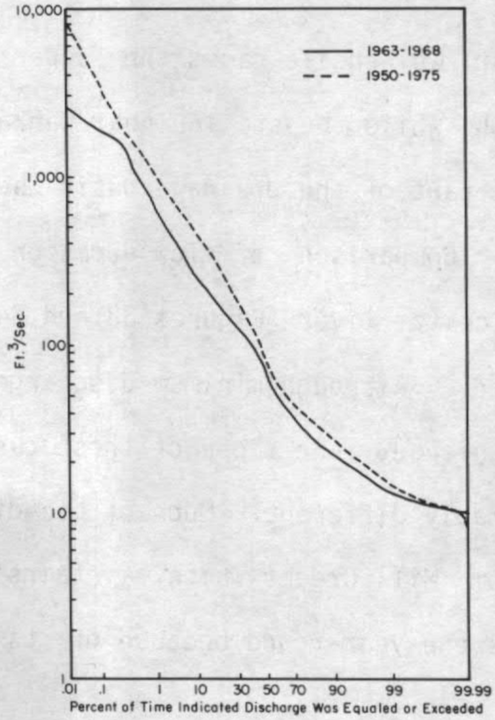

FIGURE 34. Flow duration, Little Klickitat River near Wahkaicus, Washington.

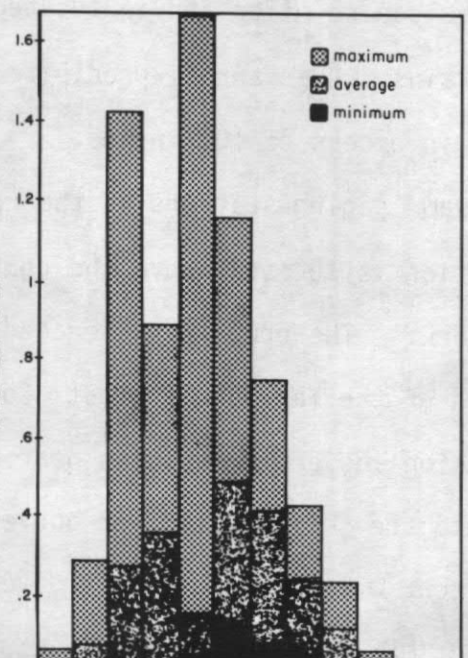

FIGURE 35. Maximum, minimum and average monthly discharge, 1958-1970, Little Klickitat River near Goldendale, Washington.

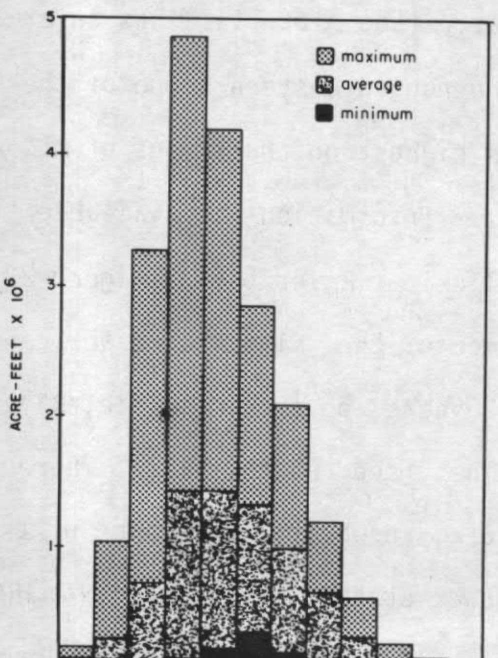

FIGURE 36. Maximum, minimum, and average monthly discharge, 1950-1975, Little Klickitat River near Wahkaicus, Washington.

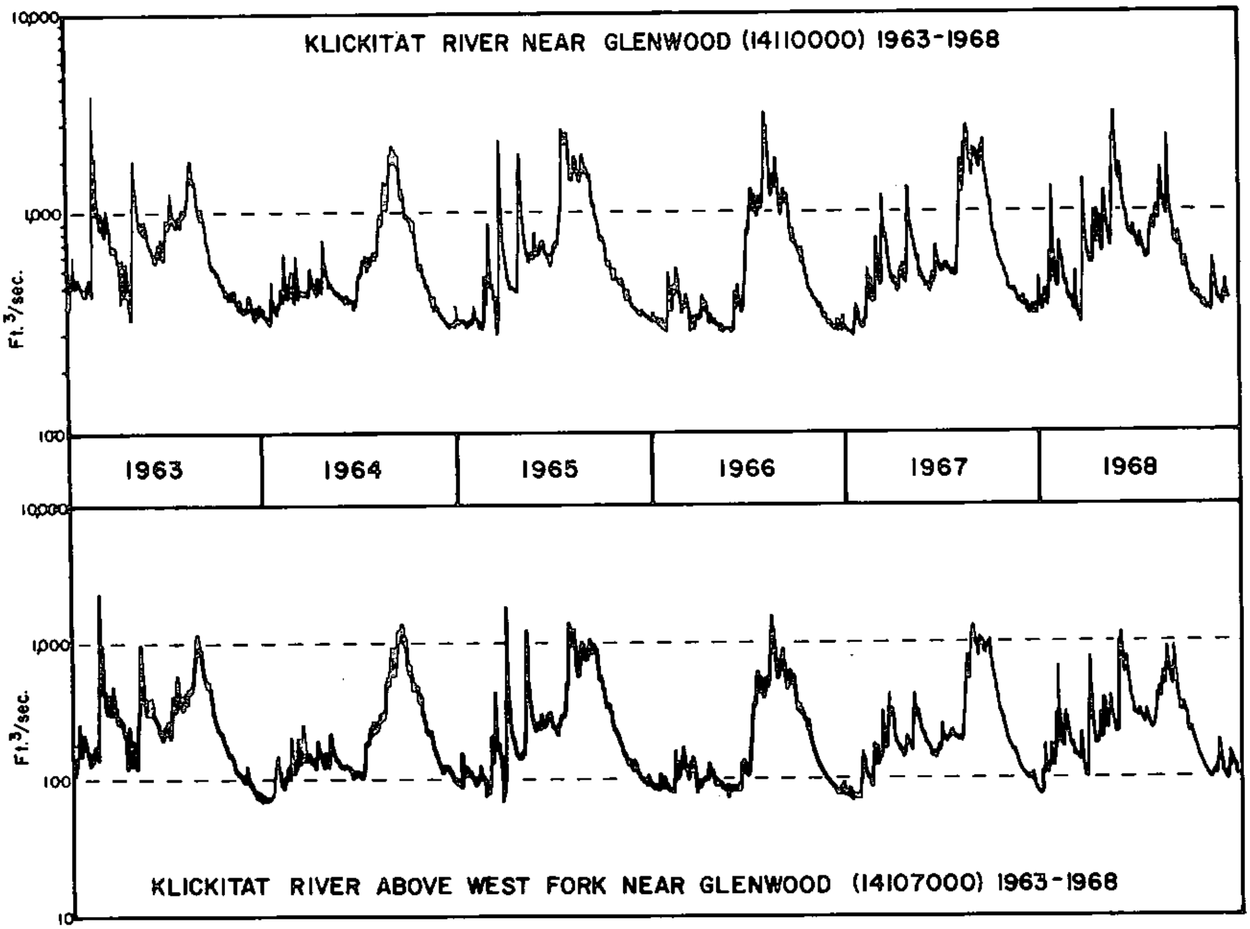

FIGURE 37. Mean daily discharge, upper Klickitat River basin, Washington.

that the stations are only 12 miles apart and that the upper basin has a general geographic uniformity. The hydrographs show little variation between high and low flows compared to hydrographs for streams to the east, and indicate that relatively high flows are maintained during dry summer months.

Maximum-minimum hydrographs (Figures 38 and 39) also illustrate the limited discharge range and reflect the contribution of ice and snowmelt to the river. The contribution of snowmelt can be seen in the bimodal appearance of the maximum hydrograph for the station near Glenwood and in the high minimum flows occurring in late spring on both hydrographs. Snowpack meltwater makes up a large percentage of the annual discharge and is responsible for

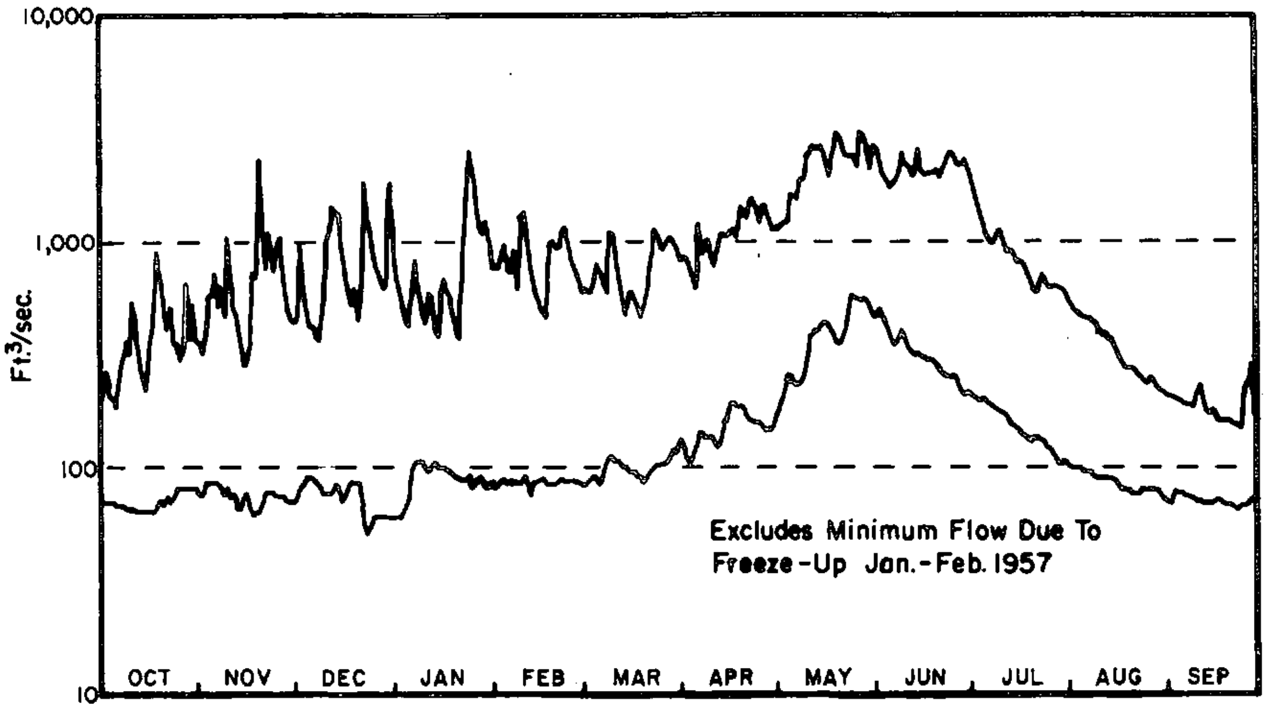

FIGURE 38. Maximum-minimum discharge, 1945-1975, Klickitat River above West Fork, near Glenwood, Washington.

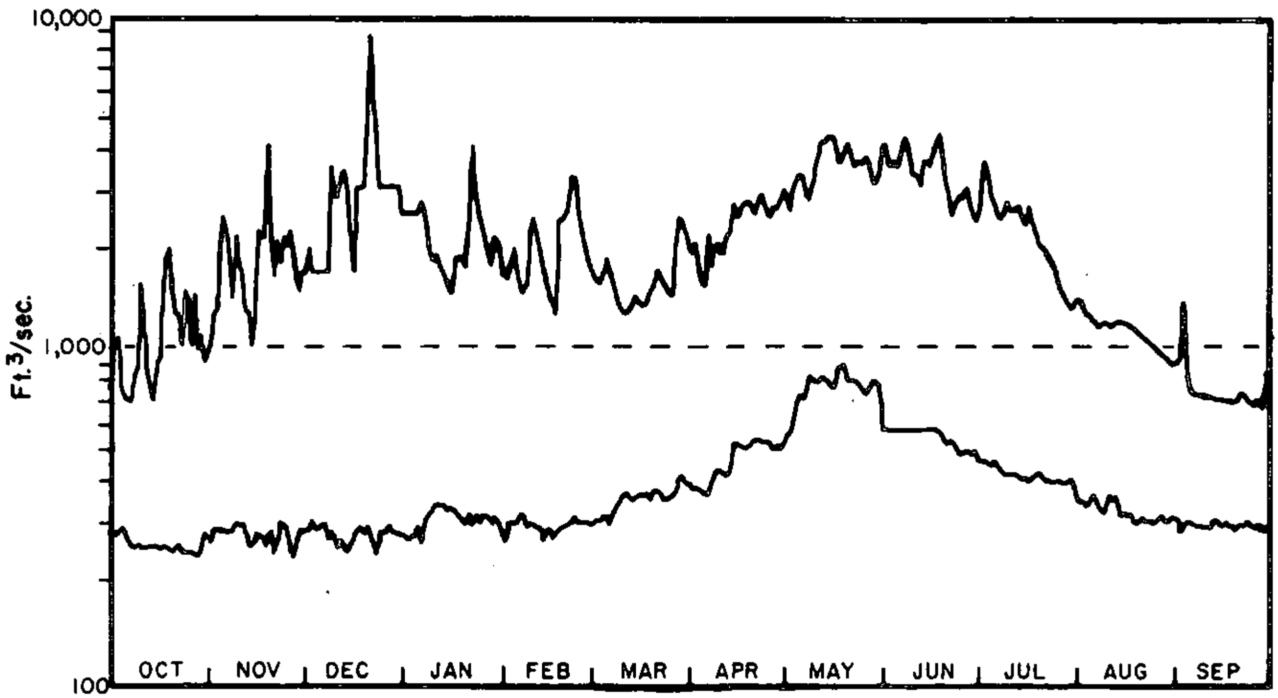

FIGURE 39. Maximum-minimum discharge, 1912-1971, Klickitat River near Glenwood, Washington.

the high sustained flow during precipitation-deficient months. The contribution from snowmelt is also evident in the monthly discharge data presented in Figures 40 and 41.

Like the stream hydrographs, the flow duration curves are very similar for both gaging stations (Figures 42 and 43), the main difference being the higher discharge at the lower station. Curves for both stations are relatively flat in their high frequency segments, which indicates good sustained flow during low-flow months. The sustained low flow is further substantiated by examination of Table 4. Analyses for both Klickitat River stations show relatively high flows, even at the projected 100-year recurrence interval. Comparison of low flow discharges in the upper Klickitat River with those of the Little Klickitat River indicate there is much less fluctuation in upper basin discharge, an apparent result of the relatively constant ice and snowmelt contribution.

Summary of Klickitat River Basin

In addition to the upper Klickitat and Little Klickitat drainage areas, the Klickitat River receives contributions from Outlet Creek, which drains the Camas Prairie-Glenwood area, Swale Creek, which drains the southern portion of the Goldendale-Centerville area, and numerous smaller drainages. Integration of all the subbasins results in a total drainage area for the Klickitat River in excess of 1300 square miles. As evidenced in the preceding section, the Klickitat Basin exhibits considerable diversity in precipitation and other basin parameters.

In addition to the stream gaging stations on the Little Klickitat and upper Klickitat Rivers, a gaging station has been operated on the main stem near Pitt, south of the town of Klickitat and about 10 miles upstream from

TABLE 4: Low-flow discharge at selected gaging stations, Klickitat County and upper Klickitat River basin, Washington*

Gaging Station: Location and U.S.G.S. Identification Number	Period of Record	Number of Consecutive Days	1.01	1.02	1.04
Klickitat River near Pitt (14113000)	1911-1915	7	938.97	903.44	865.16
		14	955.23	920.15	882.05
		30	972.30	939.36	902.90
		60	1015.21	980.70	942.47
		90	1070.96	1031.76	988.65
		120	1133.93	1091.66	1045.00
		183	1538.00	1443.00	1344.67
Klickitat River near Glenwood (1410000)	1911-1971	7	487.21	471.81	454.70
		14	495.28	480.79	464.46
		30	523.76	506.30	487.02
		60	580.60	555.69	529.19
		90	621.49	593.44	563.67
		120	686.09	652.79	617.44
		183	894.05	830.83	766.92
Klickitat River above West Fork near Glenwood (14107000)	1946-1975	7			
		14			
		30	138.82	133.09	126.88
		60	155.36	148.47	141.08
		90	180.05	170.81	160.28
		120	218.25	202.96	187.54
		183	301.52	176.78	252.15
Little Klickitat River near Goldendale (14112000)	1912, 1948-1951, 1959-1970	7	2.89	2.81	2.69
		14	3.21	3.10	2.95
		30	3.56	3.42	3.23
		60	4.62	4.34	4.02
		90	6.53	5.88	5.23
		120	10.62	8.89	7.40
		183	33.96	26.76	20.93
Little Klickitat River near Wahkaicus (14112500)	1946-1976	7	47.12	43.74	40.11
		14	47.68	44.28	40.64
		30	50.88	47.00	42.91
		60	51.11	47.75	44.13
		90	52.58	49.47	46.07
		120	57.81	54.14	50.22
		183	80.94	74.84	68.61
White Salmon River near Underwood (14123500)	1916-1975	7	784.18	751.60	716.76
		14	803.57	771.25	736.45
		30	836.43	804.72	770.00
		60	872.03	837.63	800.31
		90	922.16	882.27	839.50
		120	991.94	944.48	894.21
		183	1224.89	1153.65	1079.54

*Based on climatic year, April 1 - March 31.

1.11	1.25	2.00	5.00	10.00	20.00	50.00	100.00
808.35	757.72	667.73	586.34	547.04	516.20	483.16	462.10
824.95	773.50	680.82	595.71	554.21	521.48	486.27	463.76
847.13	795.78	700.68	610.65	565.91	530.28	491.66	466.81
883.77	829.45	728.36	632.19	584.30	546.13	504.75	478.13
923.06	863.01	752.77	649.61	598.81	558.57	515.21	487.46
973.65	908.03	786.97	673.26	617.23	572.90	525.18	494.70
1206.26	1090.19	900.02	744.81	675.29	623.10	569.57	536.47
428.36	403.89	358.08	314.11	292.05	274.38	255.12	242.68
438.81	414.50	367.81	321.76	298.28	279.31	258.52	245.02
457.53	430.36	380.01	332.26	308.49	289.54	268.97	255.73
490.49	456.65	297.95	346.43	322.08	303.19	283.19	270.55
520.37	482.65	417.60	360.94	334.31	313.74	292.03	278.35
566.06	521.34	444.43	377.77	347.60	322.61	297.40	281.58
679.62	608.84	497.74	411.60	374.35	346.94	319.25	302.47
Discharge Affected by Freeze-Up							
117.63	109.36	94.60	81.24	74.81	69.78	64.41	61.00
130.20	120.60	103.78	88.87	81.78	76.29	70.45	66.77
145.40	132.85	112.18	95.02	87.28	81.43	75.37	71.63
166.58	149.67	123.27	102.95	94.20	87.78	81.31	77.39
219.18	193.04	153.22	123.47	110.95	101.88	92.86	87.45
2.43	2.13	1.42	0.75	0.48	0.32	0.19	0.12
2.64	2.30	1.54	0.85	0.47	0.39	0.24	0.17
2.88	2.52	1.76	1.06	0.77	0.56	0.38	0.29
3.52	3.04	2.19	1.45	1.04	0.91	0.70	0.58
4.38	3.71	2.71	2.00	1.71	1.50	1.30	1.19
5.73	4.74	3.35	2.65	2.42	2.27	2.15	2.09
14.88	11.26	7.35	5.44	4.86	4.51	4.22	4.08
34.78	30.15	22.34	15.98	13.21	11.21	9.23	8.08
35.32	30.70	22.93	16.58	13.81	11.79	9.79	8.62
37.05	32.06	23.88	17.34	14.52	12.48	10.46	9.26
38.75	34.02	25.89	19.07	16.04	13.80	11.57	10.24
40.95	36.37	28.31	21.33	18.16	15.78	13.37	11.92
44.51	39.55	31.11	24.02	20.83	18.44	16.00	14.53
60.00	52.95	41.74	32.97	29.17	26.38	23.56	21.86
665.59	620.50	541.58	471.55	438.20	412.23	384.63	367.14
684.86	638.95	557.59	484.36	449.15	421.61	392.21	373.52
717.46	669.67	582.61	501.89	462.38	431.19	397.68	376.27
744.48	694.31	604.29	522.20	482.42	451.18	417.74	396.44
776.46	720.76	622.96	536.02	494.61	462.40	428.22	406.59
821.33	758.09	649.64	555.90	512.12	478.42	433.00	420.77
974.49	885.70	738.68	617.07	562.05	520.50	477.57	451.03

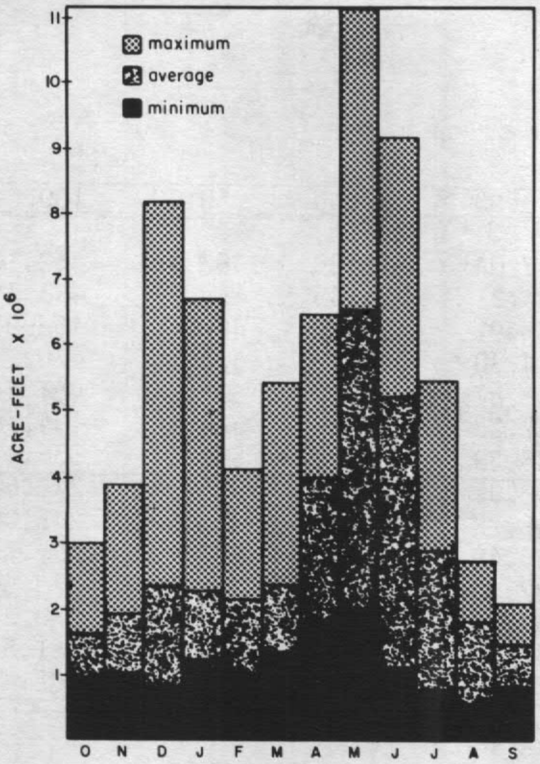

FIGURE 40. Maximum, minimum, and average monthly discharge 1911-1971, Klickitat River near Glenwood, Washington.

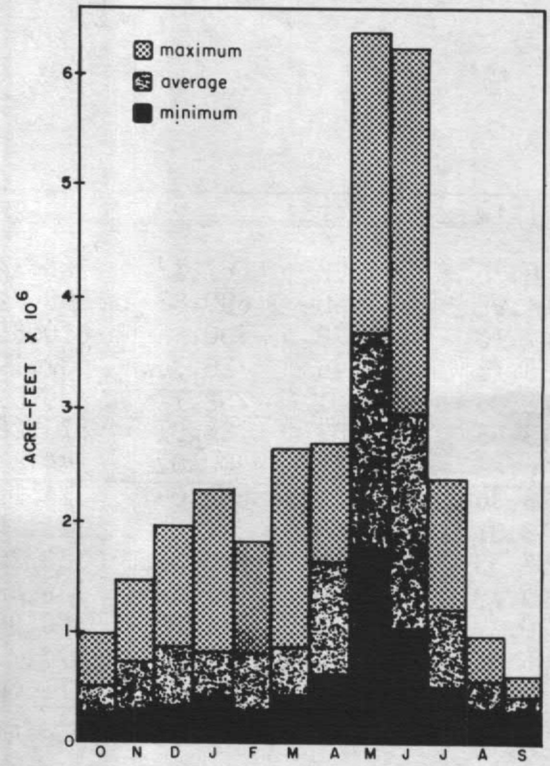

FIGURE 41. Maximum, minimum and average monthly discharge 1945-1975, Klickitat River above West Fork near Glenwood, Washington.

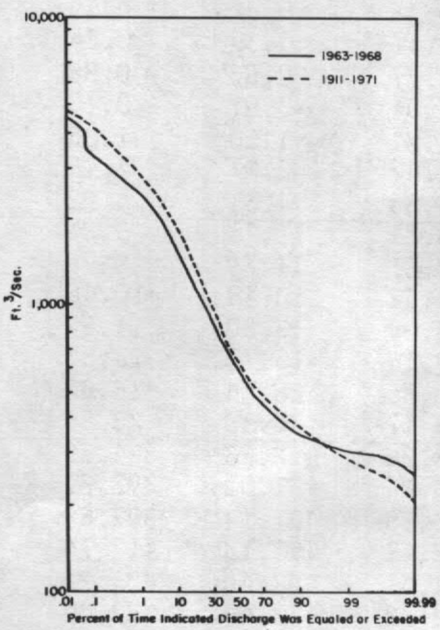

FIGURE 42. Flow duration, Klickitat River near Glenwood, Washington.

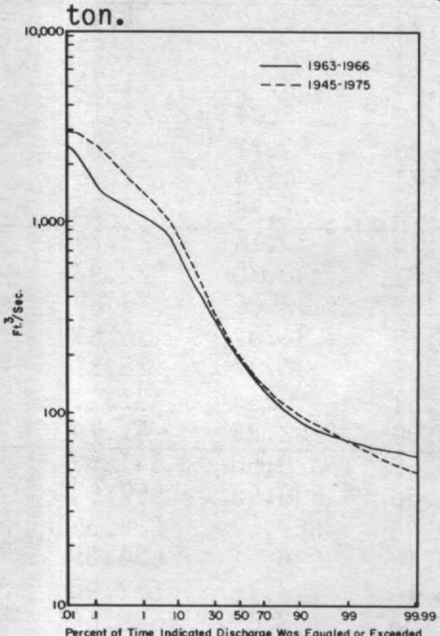

FIGURE 43. Flow duration, Klickitat River above West Fork near Glenwood, Washington.

the river's mouth. This station, which provides an overall picture of the river's characteristics, has been operated continuously since 1928. The records are affected by a major diversion to Hellroaring Ditch mentioned earlier.

As might be expected, information gathered at the Pitt station represents an integration of that described for the Little Klickitat and upper Klickitat basins. Basin runoff (Table 3) is about twice that of the Little Klickitat near Wahkaicus and about half that of the Klickitat River near Glenwood. Similarly, average discharge of the Klickitat River appears to be about half of the average discharge at Pitt. However, a comparison of high flows reveals that discharge of the Little Klickitat near Wahkaicus is more than one third of the peak discharge of the Klickitat River at Pitt.

Comparison of the six-year hydrographs of the Pitt station (Figure 44) with those of the other stations reveals a closer resemblance to flows in the upper basin than those in the Little Klickitat River. However, in many instances, the hydrograph is a composite with marked similarity of selected events apparent in comparison with hydrographs from the Little Klickitat and upper Klickitat basins. Monthly discharges (Figure 46) also represent a combination of conditions from different parts of the basins as maximums reflect the immediate runoff from all areas whereas averages reflect the contribution from snowpack in the upper basin.

Flow duration curves (Figure 47) prepared for the station near Pitt indicate relatively little annual variation and a sustained low flow. Analyses of low flows for all stations on the central Klickitat River reveal that minimum flows at the Pitt station are considerably higher than those in the upper basin. The addition of low flows from the Little Klickitat and other southern drainages cannot account for the difference. Instead, the

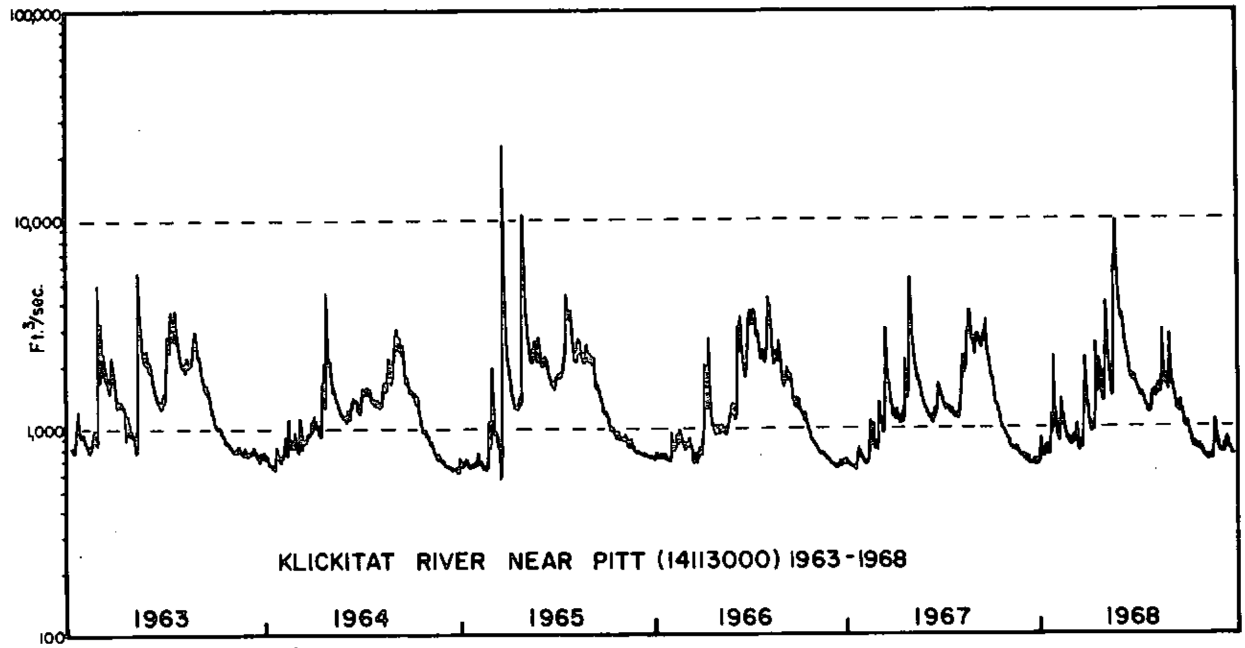

FIGURE 44. Mean daily discharge, Klickitat River near Pitt, Washington.

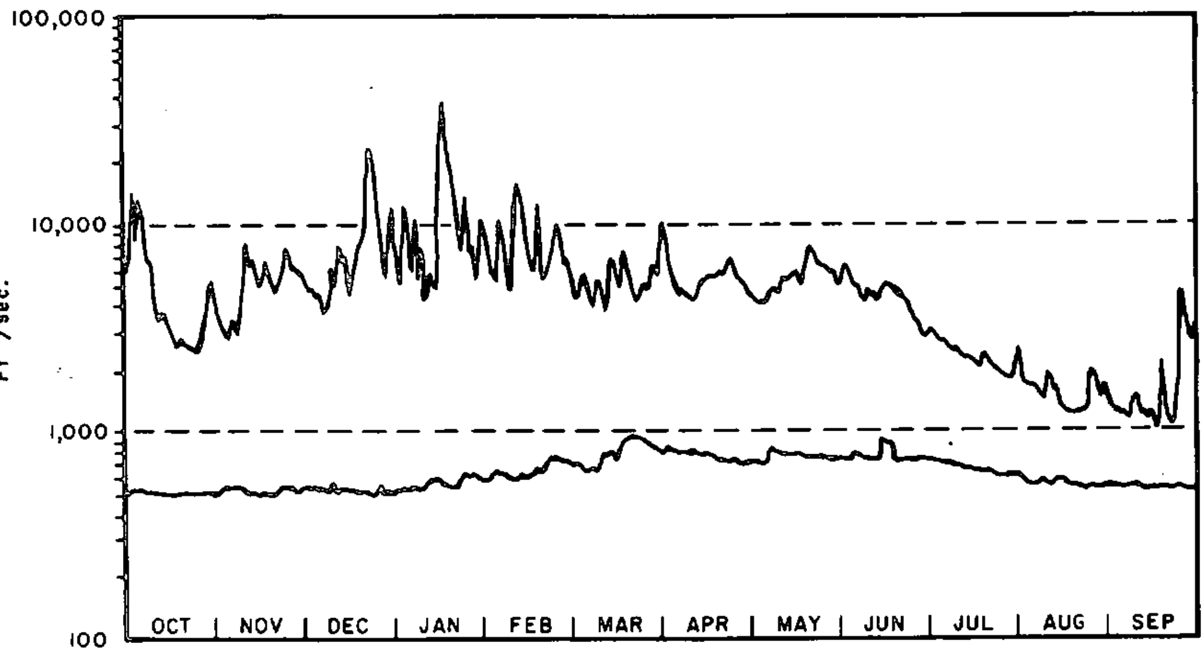

FIGURE 45. Maximum-minimum discharge, 1928-1978, Klickitat River near Pitt, Washington.

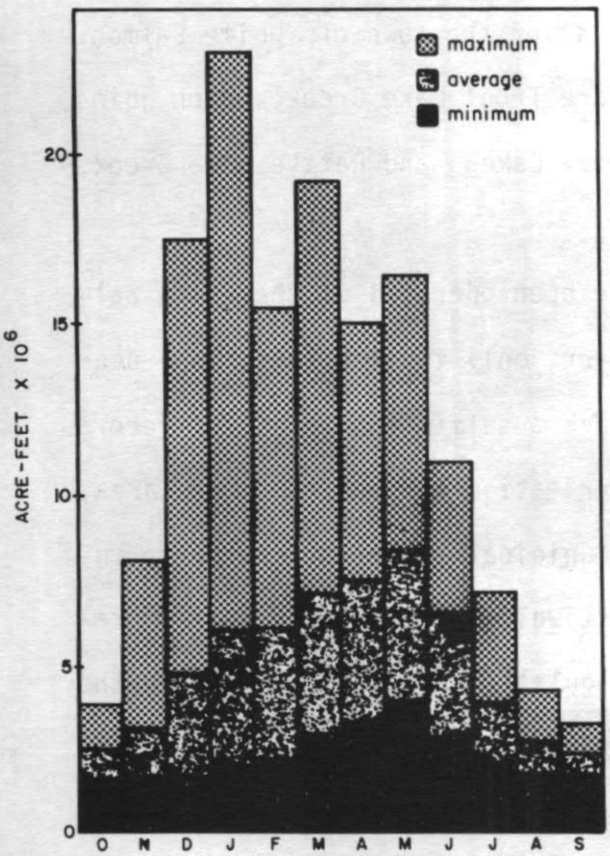

FIGURE 46. Maximum, minimum and average monthly discharge, 1929-1975, Klickitat River near Pitt, Washington.

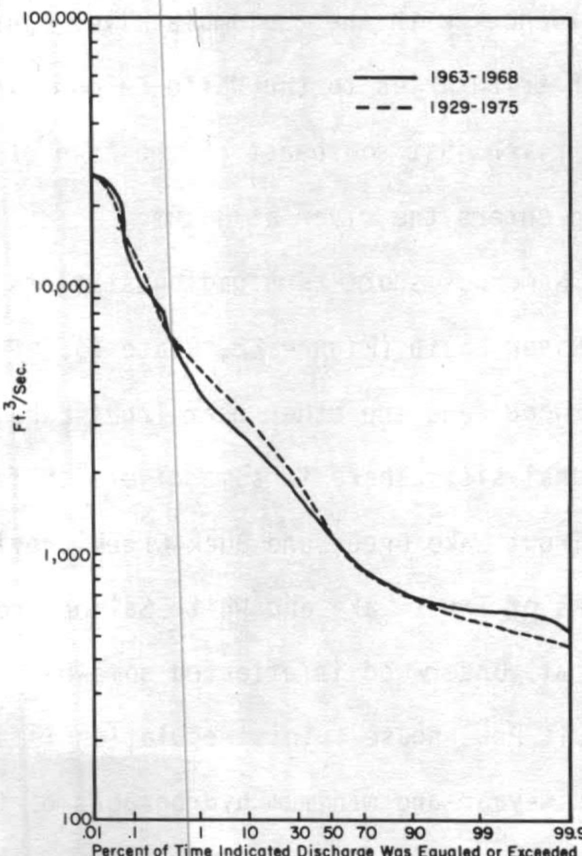

FIGURE 47. Flow duration, Klickitat River near Pitt, Washington.

low flows are attributed to ground-water inflow to the main Klickitat River from several large springs near the northern border of the county.

White Salmon River Basin

Located in the extreme western part of Klickitat County, the White Salmon River drains an area of approximately 385 square miles. Like the Klickitat River, headwaters of the White Salmon River are located on the southern slopes of Mt. Adams. The White Salmon basin exhibits extremely rugged topography and is composed of series of small isolated tributary drainages. From its headwaters, the White Salmon River flows essentially due south to its confluence with the Columbia River just west of the town of White Salmon. Major tributaries to the White Salmon River are Trout Lake Creek, which joins the river just southeast of the town of Trout Lake, and Rattlesnake Creek, which enters the river at Husum.

Numerous short-term gaging stations have been operated in the White Salmon River basin (Figure 22, Plate I). However, only two stations, one near Underwood and the other near Trout Lake, have a sufficient length of record for analysis. There is some diversion for irrigation in the Trout Lake area, and Trout Lake Creek and Buck Creek provide municipal supplies for the communities of Trout Lake and White Salmon, respectively. The gaging station record at Underwood is affected somewhat by regulation being located below the Conduit Powerhouse. This regulation is apparent in the oscillating nature of the six-year and minimum hydrographs of the station.

The White Salmon basin receives precipitation in the form of snow at higher elevations and as rain over the remainder of the basin. Mean annual precipitation in the lower part of the basin is 45-50 inches and increases substantially in higher northern areas.

The effect of relatively high precipitation throughout much of the White Salmon River basin is apparent from a comparison of average annual discharge for this stream with that of the Klickitat River (Table 3). While the drainage area of the White Salmon River is less than one-third of that of the Klickitat River, the average discharge at Underwood is 1140 cfs, compared to 1630 cfs for the Klickitat River at Pitt. The six-year mean daily hydrographs of the two stations on the White Salmon River (Figure 48) reveal only moderate fluctuations in flow, with peak and low flows varying little from the annual mean. Hydrographs for both stations exhibit striking similarities. Direct correlation of individual events is apparent although recession

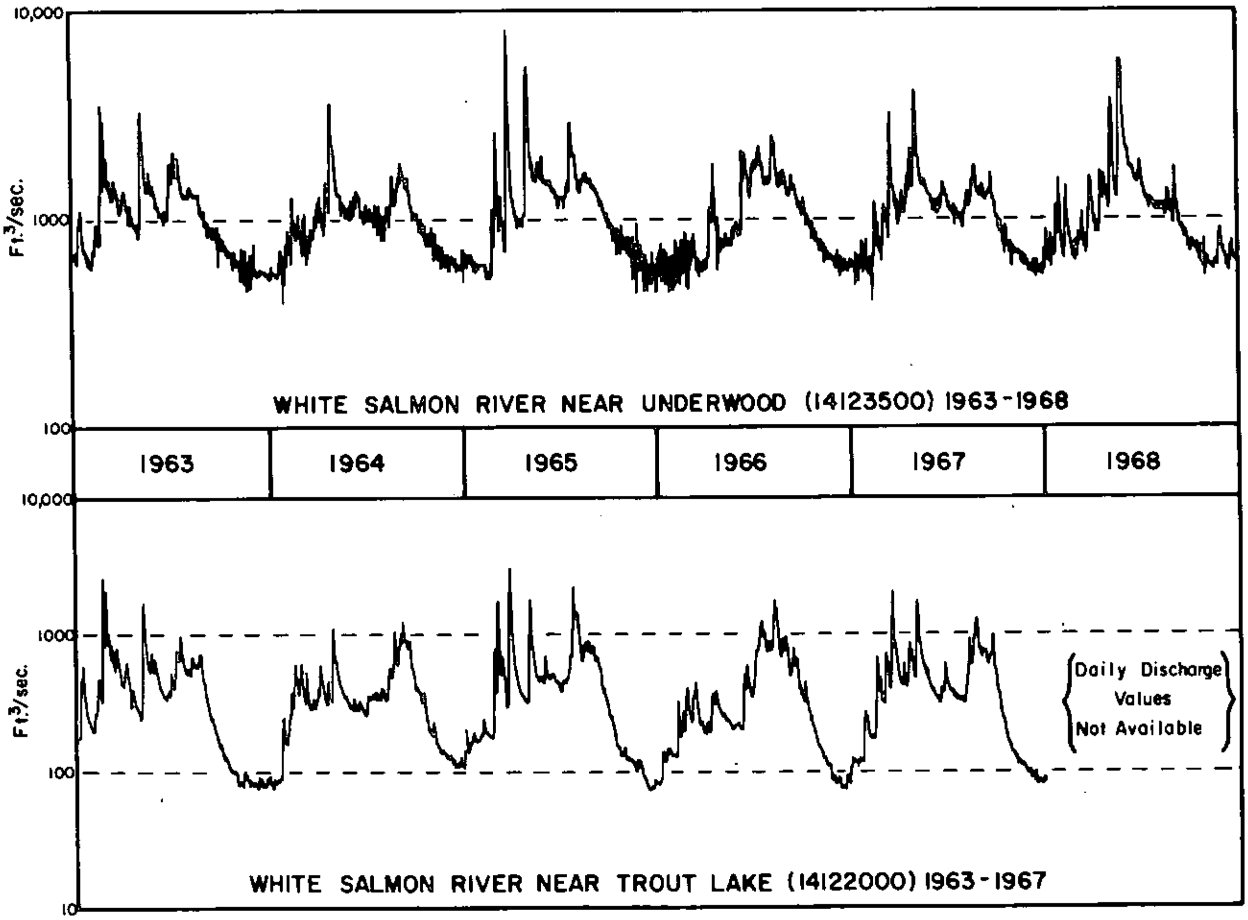

FIGURE 48. Mean daily discharge, White Salmon River, Klickitat County, Washington.

limb slopes reflect the additional contributions to the river from Rattlesnake Creek and a ground-water inflow from a series of springs in the Husum area. A comparison of the six-year hydrographs with those of the upper Klickitat basin reveals a relatively good correlation of events. This similarity is a response to the common source area (Mt. Adams) for both streams and similar basin geography.

The maximum-minimum hydrographs (Figures 49 and 50) and monthly minimums, maximums and means (Figures 51 and 52) for these streams readily show the influence of late spring and early summer snowmelt. Although still

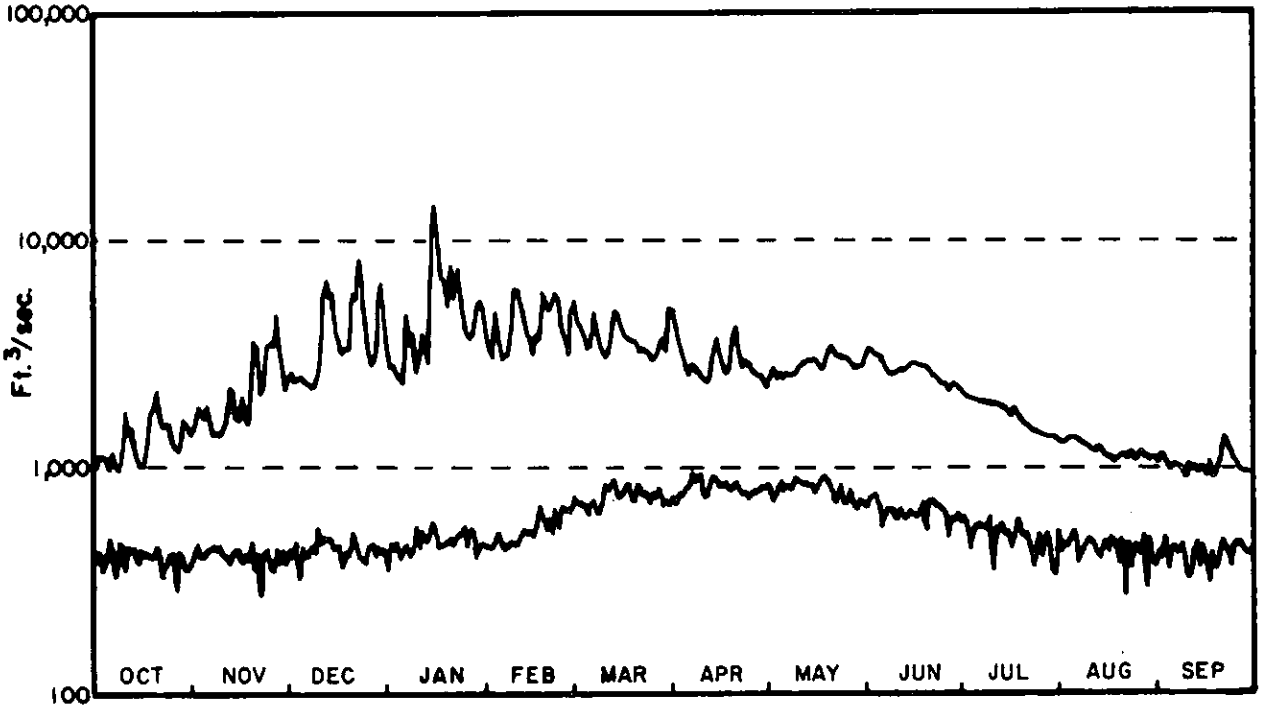

FIGURE 49. Maximum-minimum discharge, 1935-1975, White Salmon River near Underwood, Washington.

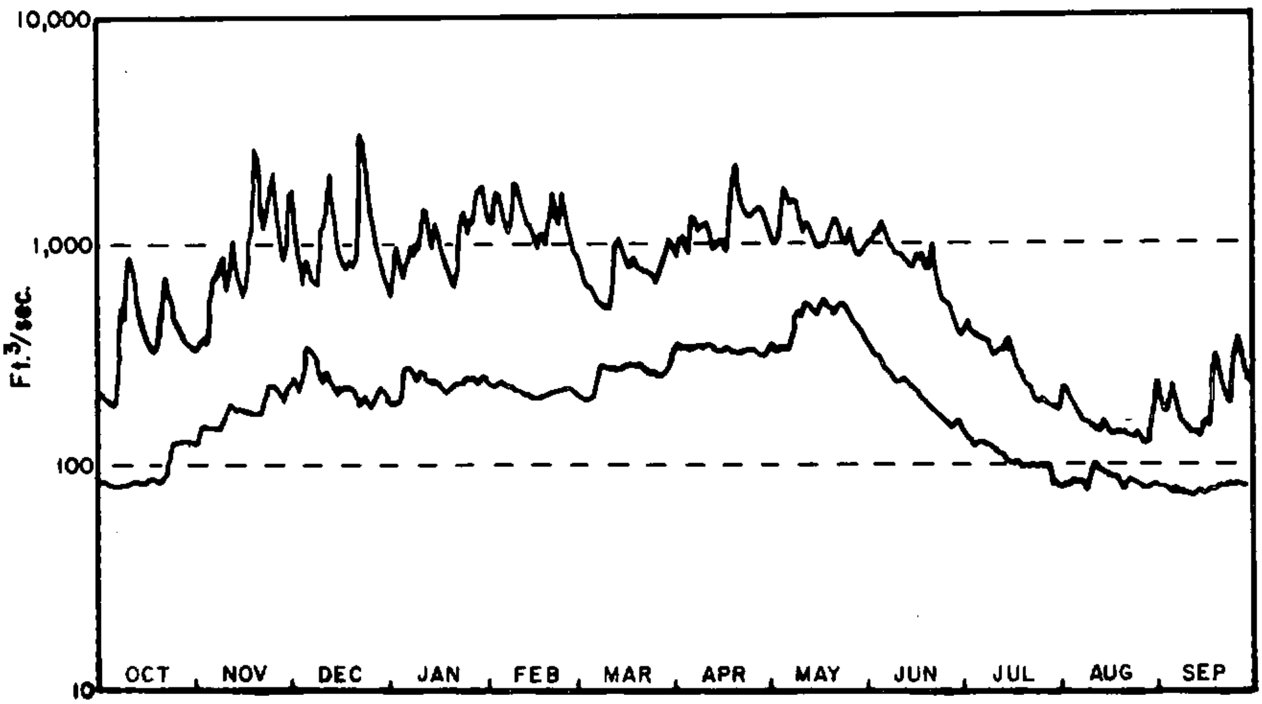

FIGURE 50. Maximum-minimum discharge, 1958-1967, White Salmon River near Trout Lake, Washington.

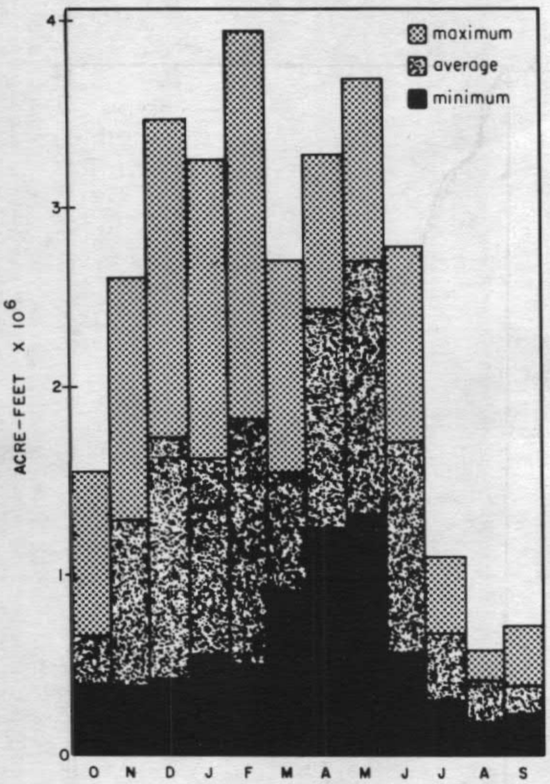

FIGURE 51. Maximum, minimum and average monthly discharge, 1958-1967, White Salmon River near Trout Lake, Washington.

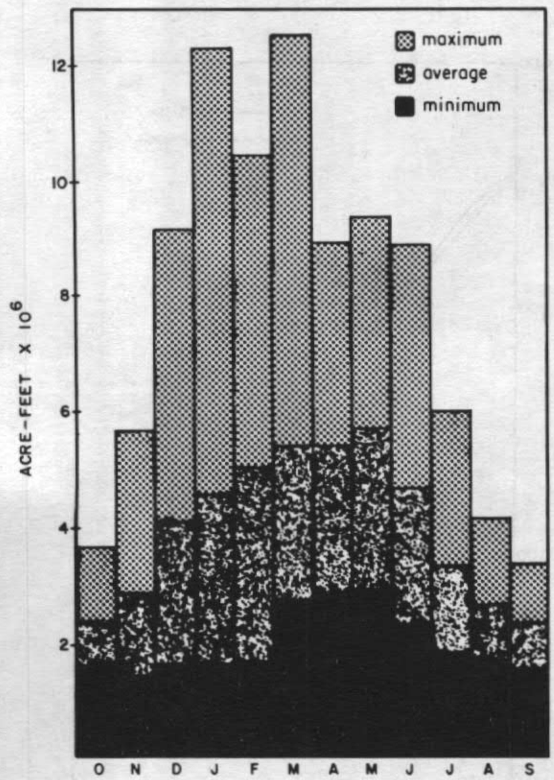

FIGURE 52. Maximum, minimum and average monthly discharge, 1935-1975, White Salmon River near Underwood, Washington.

evident, the effect is less apparent in the White Salmon River basin than in the upper Klickitat. Although some of the snow fields of Mt. Adams feed the White Salmon River, it does not have the large upper drainage development that exists in the Klickitat River basin, and a correspondingly smaller amount of its total flow is derived from melting of snow and ice. It is likely, however, that the White Salmon River derives a greater contribution from ground water than does the Klickitat River.

Flow duration curves (Figures 53 and 54) are very similar in both six-year and period-of-record totals, indicating that discharge variation from year to year is low. The horizontal low-flow part of the curves implies a

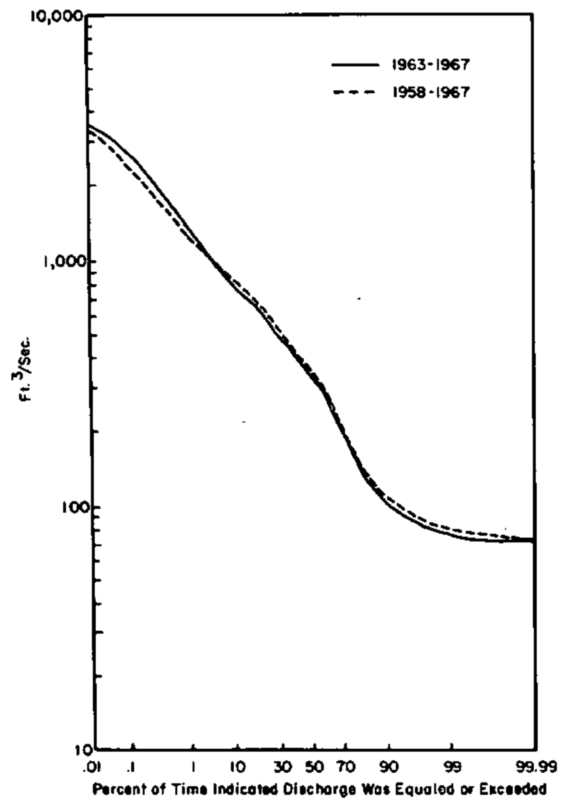

FIGURE 53. Flow duration, White Salmon River near Trout Lake, Washington.

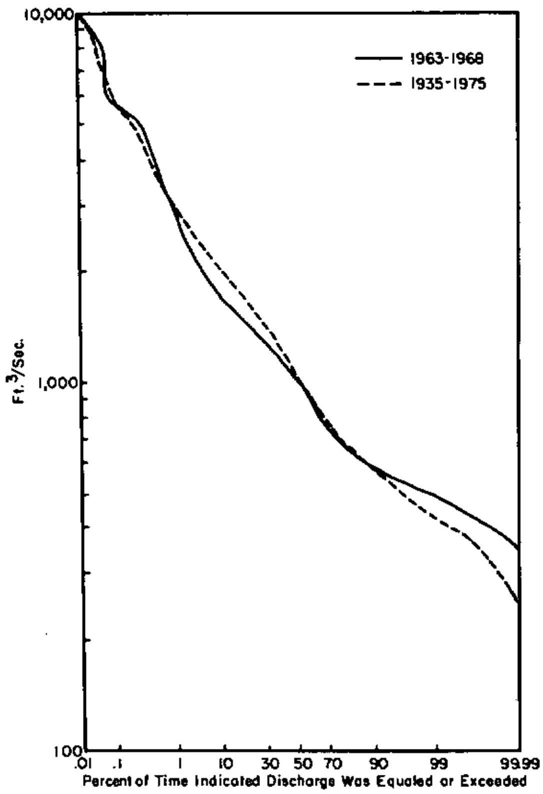

FIGURE 54. Flow duration, White Salmon River near Underwood, Washington.

good sustained flow during low-flow periods which is confirmed in low-flow analysis (Table 4).

Summary

Surface-water hydrology is clearly influenced by the geographical variation present in Klickitat County. Analysis of drainage basin hydrology reveals a gradational change from intermittent streams with highly variable discharges in the east, to perennial streams with relatively constant discharge in the west. Stream flows in the western area are sustained by melting snows and contributions from ground water, while streams in the east flow only in response to direct precipitation runoff. Streams in the central part of the county represent a transition between the two extremes with either very low minimum discharges or a lack of flow during the driest months.

The intermittent nature of surface-water supplies in the eastern half of the county limits their availability for irrigation and other uses. Streams in the west, however, have good sustained low flows and are thus available for use during the entire year.

Floods

Flooding occurs most often during the high runoff months, normally in late winter or early spring. Although flooding is a normal periodic occurrence of most streams, it has significant effects on the cultural modification of flood-prone areas. Hence, information on flood magnitude and occurrence is important to flood plain development and design of flood control projects, bridges, culverts, road beds, and buildings.

While it is presently impossible to predict the time of occurrence of a flood of a given magnitude, flood-frequency analysis can provide an idea of the probability of occurrence of a given size flood in any one year. Flood-frequency analysis is based upon the historical stream discharge record and involves calculation of the interval, in years, during which a certain stream discharge is likely to be equaled or exceeded. With gaging records of sufficient length, flood-frequency curves can be plotted which provide an indication of the recurrence interval of a given discharge within a given time frame.

Figures 55 and 58 are flood frequency curves for selected stations in the Klickitat and White Salmon River drainages. The curves were prepared

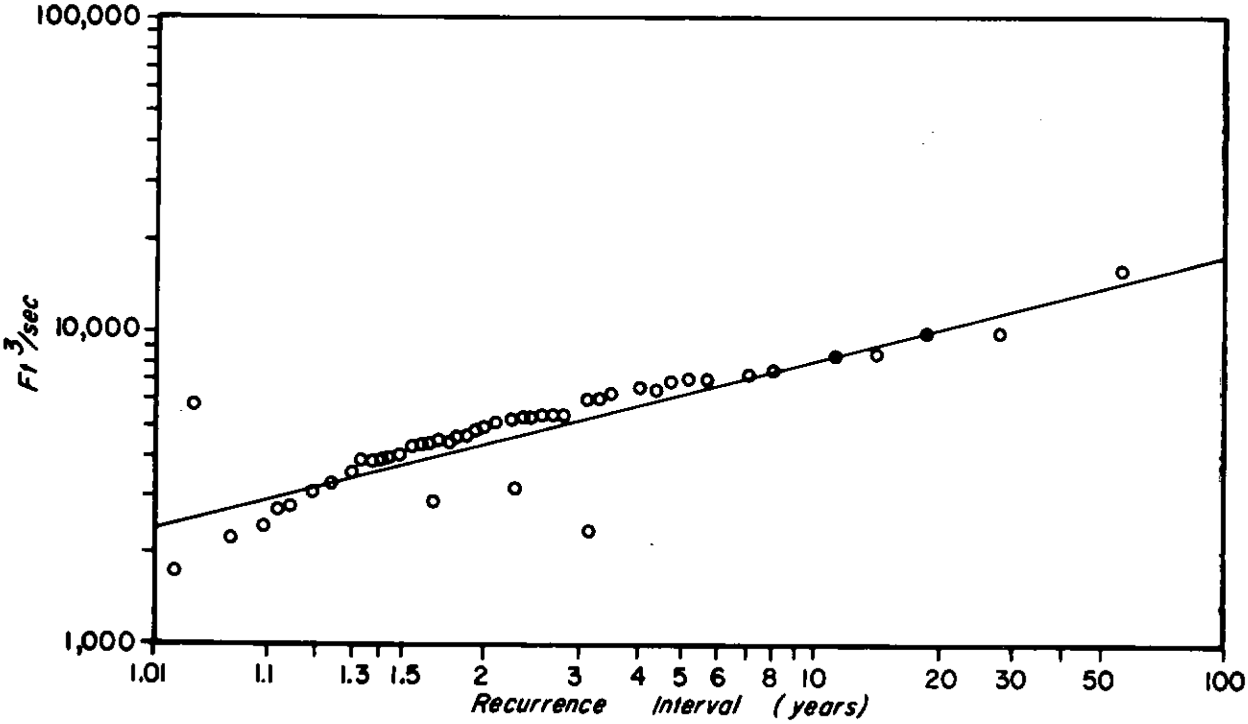

FIGURE 55. Flood frequency, 1916-1975, White Salmon River near Underwood, Washington.

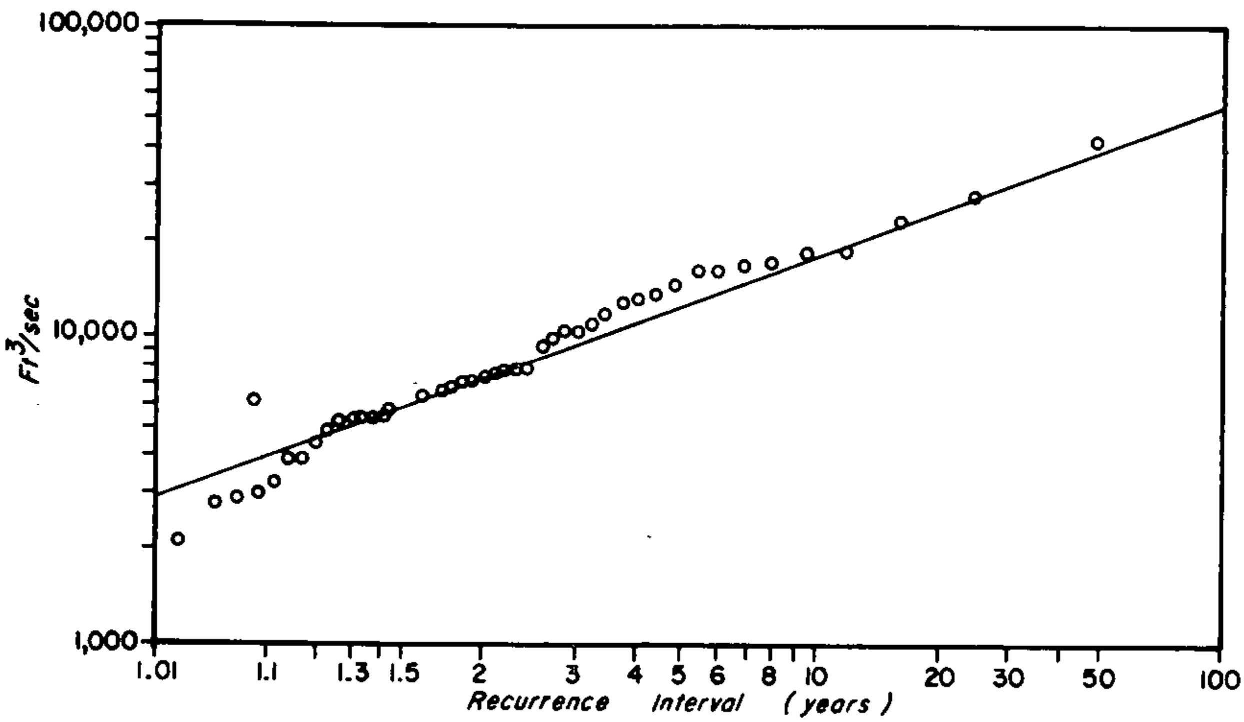

FIGURE 56. Flood frequency, 1929-1975, Klickitat River near Pitt, Washington.

only for those gaging stations in the study area with relatively long periods of record. Peak discharges for many gaging locations within the county and upper Klickitat River basin are presented in Table 3. Information on flood frequencies in Klickitat County is also presented in reports by Cline (1976) and Longfield (1974).

Data Preparation

To obtain the information for Figures 55 through 58, annual peak discharges were first placed in order, from largest to smallest, for the entire period of record for each gaging station. The recurrence interval of each annual maximum was then calculated using the technique outlined by Dalrymple (1960), in which each point is plotted using a log probability scale which tends to make the data plot as a straight line. A line was then fitted to the points to produce the flood-frequency curve. Any point on the line will give the probable recurrence interval of a flood of a given magnitude.

Although the flood-frequency curve is a useful analytical tool, some care must be exercised in its use. Although the curve indicates the recurrence interval, in years, of a flood of given magnitude, it is not possible to predict when a flood of that magnitude will occur. For example, it is possible for two floods with a 100-year recurrence interval to occur in consecutive years or on consecutive days. Futhermore, because the curve is a "best fit" to the data, considerable variation in position of the curve is possible and exists in some of the plots. Since the discharge scale is logarithmic, a change in curve position could have substantial effect on the projected magnitude of a flood at a given recurrence interval. Finally, curves are prepared only for the period of time for which stream gaging information is available, a period which seldom exceeds 50 years in Klickitat

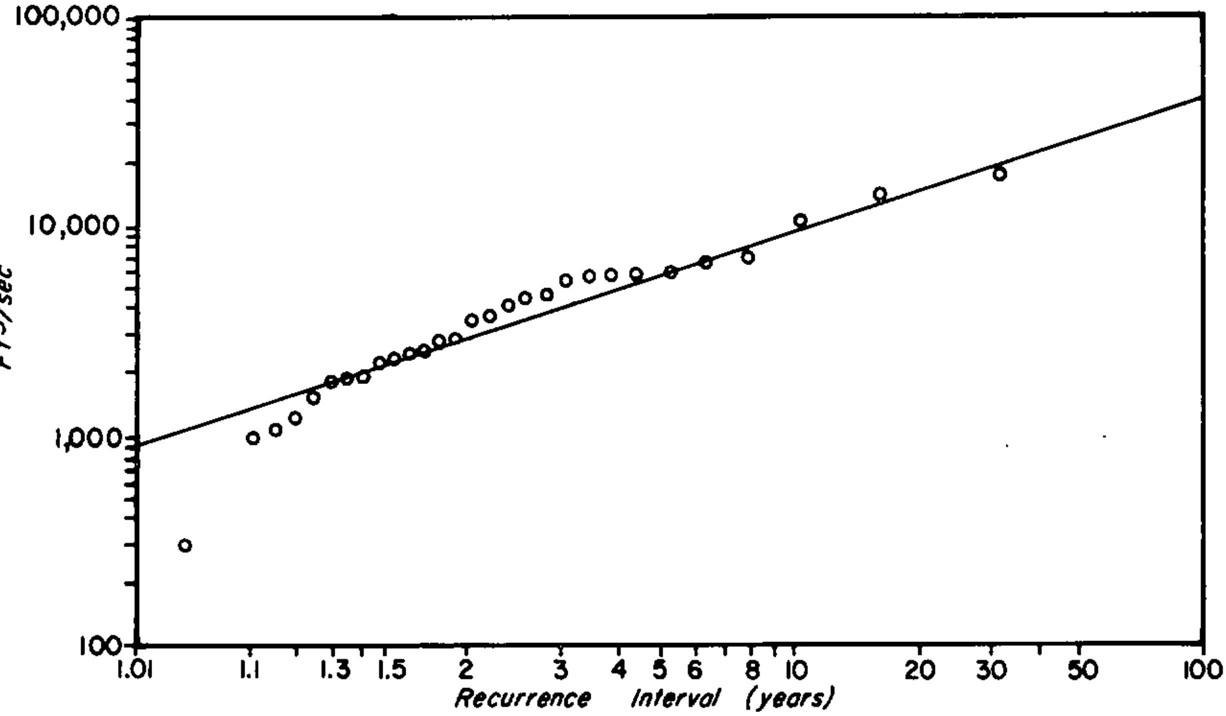

FIGURE 57. Flood frequency, 1948-1975, Little Klickitat River near Wahkaicus, Washington.

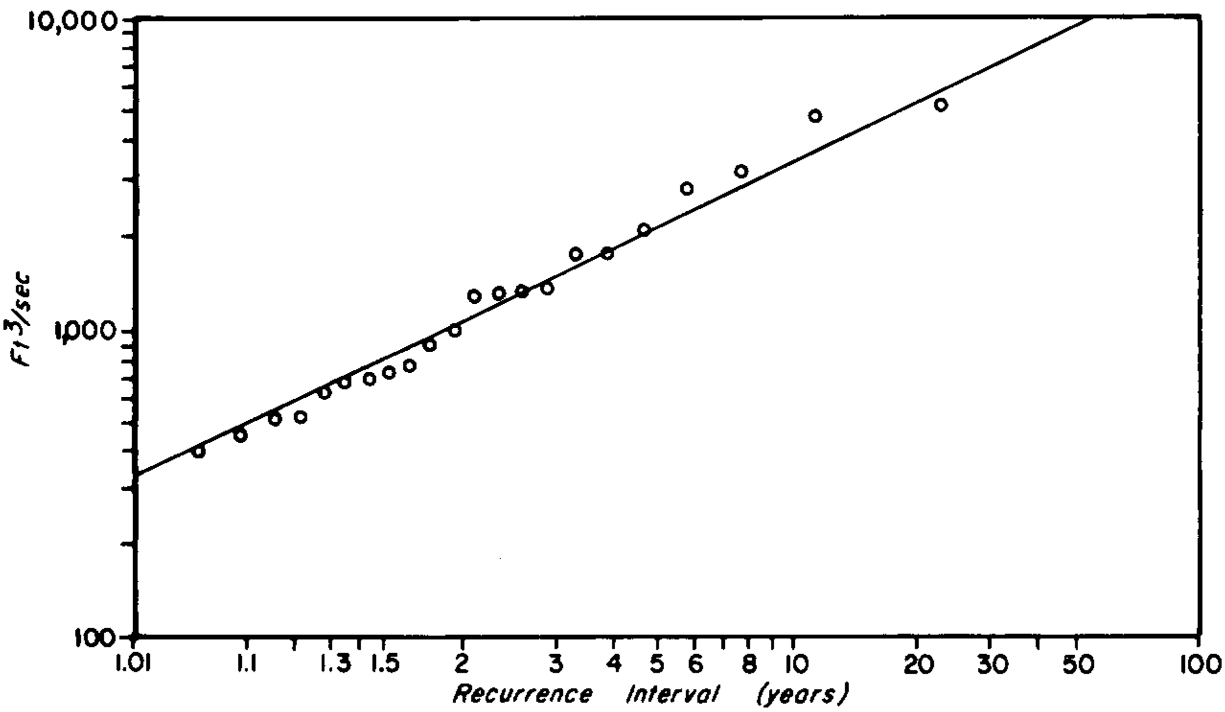

FIGURE 58. Flood frequency, 1947-1975, Little Klickitat River near Goldendale, Washington.

County. Since many drainage basin parameters (vegetation, slope, cultural modifications) are changing, it is unlikely that any past record will be totally representative of a stream's flood characteristics in the future. Despite these drawbacks, a carefully prepared flood-frequency curve for a station with sufficient record can be a valuable hydrologic tool.

Sufficient record for flood-frequency analyses were available only for the White Salmon and Klickitat Rivers. Flood-frequency data for the upper Klickitat River are provided by Cline (1976).

Flood Magnitude and Frequency

Instantaneous discharge maximums for most streams in the western half of the county resulted from the same storm events. Maximum annual floods recorded on the Little Klickitat River near Goldendale were 4,750 cfs on January 16, 1974, and 5,200 cfs on December 23, 1964. Maximum flood flows for the Little Klickitat River near Wahkaicus were 14,500 cfs on January 16, 1974, and 17,300 cfs on December 23, 1964. Figures 55 and 56 suggest discharge maximums of these magnitudes may have recurrence intervals of 30-40 years. Annual flood maximums for the Klickitat River at Pitt occurred at almost the same time as those on the Little Klickitat; however, the relative magnitudes of the events are different. At the station near Pitt, the peak discharge of January 16, 1974, was 47,400 cfs and far exceeded that of December 29, 1964, which was 31,100 cfs. Similarly on the White Salmon River, a maximum discharge of 15,300 cfs was measured at Underwood (see Figure 56) in January 1974. This exceeded by 1-1/2 times the previous high of 9,700 cfs recorded on December 29, 1917. Flood-frequency analyses (Figures 57 and 58) indicate the maximums recorded for these stations have a recurrence interval of 50 to 100 years.

Although annual maximums recorded in 1974 on both the upper Klickitat and the Little Klickitat drainages were well below the historical extremes, the combination of rapid heavy runoff from all areas of the Klickitat River basin produced a very severe flood in January of 1974. This flood was extremely damaging in the lower basin, destroying property, roads and bridges.

Circumstances which produced the 1974 flood are probably similar to those that cause most major flooding in the county. Adequate fall precipitation allowed soils in most areas to reach field capacity. Snowfall during early winter was not excessive, but it was widespread and blanketed both lowland and mountain areas. Furthermore, the snow had a relatively high moisture content (Longfield, 1974). A severe storm system, moving in from the Pacific in mid-January, caused continued precipitation, mainly in the form of rain, for several days. Concurrently, above normal temperatures prevailed with freezing levels rising as high as 8,000 feet. The combination of steady precipitation and saturated or frozen soils produced widespread runoff. The runoff was uniform in that it came from virtually all areas of the drainage basin and produced extremely high flows in lower reaches of the streams.

While stream flow records were insufficient to prepare flood-frequency curves for streams in eastern Klickitat County, an estimate of the order of magnitude of annual floods for Rock and Alder Creeks can be obtained from the maximum hydrographs (Figures 24 and 27) from Table 3, and from crest-stage measurements (Table A-3, Appendix A). Examination of these data indicate that conditions of late December 1964 produced very high flood flows in both Alder Creek and Rock Creek. Table 3 reveals that, although basin runoff is low for streams in eastern Klickitat County, maximum discharge of these streams exceeds that of others with greater drainage area to the west. These data verify the "flashy" nature of streams in eastern Klickitat County and suggest a high potential for flash flooding in these basins.

All drainage basins within the county have generally steep slopes which can produce rapid runoff and serious floods. This potential must be considered in planning any development or use of flood-prone areas within the county.

GROUND-WATER RESOURCES

Introduction

Most of Klickitat County's household and irrigation water supplies are derived from ground-water sources, which include both springs and wells. In areas of high effective precipitation, springs are abundant and provide some household and stockwater supplies. However, in much of the county wells are the primary water source.

Ground water constitutes that part of an area's annual precipitation that is not lost as runoff or evapotranspiration and which percolates into the subsurface. A ground-water system is dynamic so that recharge to and discharge from the subsurface is an ongoing process. The storage capability of the subsurface is not infinite and maintenance of adequate ground-water supplies depends upon annual recharge in quantities sufficient to keep pace with ground-water use. In order to determine if adequate ground-water supplies exist, it is necessary to evaluate a wide variety of related information.

Ground-water information is presented in several sections of this report. However, most of the raw data collected are presented in the Appendix. In the following sections, type of data collected is discussed, followed by a discussion of the general water-producing capabilities of the major geological units in the county. Finally, an analysis of the availability of ground water for individual areas in the county is presented.

Basic Data

Several methods of data collection were used in obtaining information on ground-water supplies. A county-wide well inventory was prepared, drilling information from recorded driller's logs was compiled, monitoring wells were established throughout the county, and borehole geophysical data obtained from selected wells were evaluated. Mass water-level measurements of wells in the Goldendale-Centerville area which were made by Washington State Department of Ecology personnel in 1974 and 1975 have been included. A brief description of each of these investigative methods is provided below.

Well Inventory

Wells far exceed all other sources for water supplies in Klickitat County, and a majority of these were inventoried. The inventory included the collection and evaluation of existing records and the canvassing of most of the county to obtain information from individual well owners. In the canvassing effort, static water-level measurements were made whenever possible. The results of the inventory are presented in Appendix B.

List of Selected Well Logs

Appendix C contains driller's logs for selected wells throughout the county. The logs are presented to provide general information on drilling conditions in specific areas of the county and to provide more detailed information on some of the wells included in the well inventory. In most cases, the selected wells can be considered representative of the subsurface and aquifer conditions in the county.

Observation Wells

Monthly water-level measurements were made in 24 observation wells at various locations throughout the county. Wells in this network were selected to provide information characteristic of the several areas of differing subsurface hydrology. The measurements provide baseline data on the annual and long-term fluctuations in water level of these areas. The data collected from the observation wells is tabulated in Appendix D and graphically presented in well hydrographs. Water-level measurements made by the U. S. Geological Survey in three additional wells are included.

Borehole Geophysics

Borehole geophysical logs were run in selected wells in the Bickleton and Goldendale-Centerville areas to obtain additional stratigraphic and hydrologic information. Geophysical logging of a well involves trolling the well with special sondes, or tools, which respond to changes in various borehole parameters. Borehole geophysics is useful in obtaining information on geologic conditions, as well as in locating aquifers and analyzing water movement in a well.

The wells for which geophysical logs were prepared are noted in Appendix B and, although the log responses, per se, are not reproduced in this report, the information obtained from the borehole geophysics is incorporated in discussions of the hydrology of the respective areas.

Mass Water-Level Measurements

A need for discrete hydrologic information plus concern over the possible effects of increased ground-water withdrawal in the Goldendale-Centerville area prompted the Department of Ecology to initiate a study of that area. The study included the measurement of static water levels in all available wells within the study area during the spring and fall for a two-year period. The object of the mass measurement was to define the water table and/or potentiometric surface of the area and to ascertain the effect of heavy ground-water withdrawal on these surfaces. To eliminate the direct effects of pumping, the measurements were made in the early spring, before most irrigation began, and late in the fall after irrigation had ceased.

Static water-level measurements were made in the spring and fall of 1974 and 1975 by department personnel and are incorporated in this report. Appendix E presents the raw field measurements along with well-head elevations estimated from U. S. Geological Survey topographic maps. From this tabular information, water level elevations were calculated and contoured for each measurement period.

Well Numbering System

To avoid confusion in well locations a system used by the U. S. Geological Survey was adopted in this report. Each well is given an alphanumeric designation based upon the legal description of the land on which it is located.

The well is located first by township and range and then by section. Because all of Klickitat County is north of the Willamette Base Line and east of the Willamette Meridian, the directional notation normally accompanying legal descriptions is omitted. Each section is then divided into sixteen 40-acre parts, each with a different letter designation as shown in Figure 59. The identification number of each well, then, consists of the township and range, followed by the section, which is in turn followed by the letter designation of the appropriate 40-acre plot. Thus, a well located in the 40-acre area corresponding to the NW 1/4 of the NW 1/4 of Section 24, T. 3 N., R. 15 E. would be 3/15-24D1. If more than one well is located on the same 40-acre plot, they are coded in numerical order according to their relative ages. Thus, if two wells were located in the above described 40-acre area,

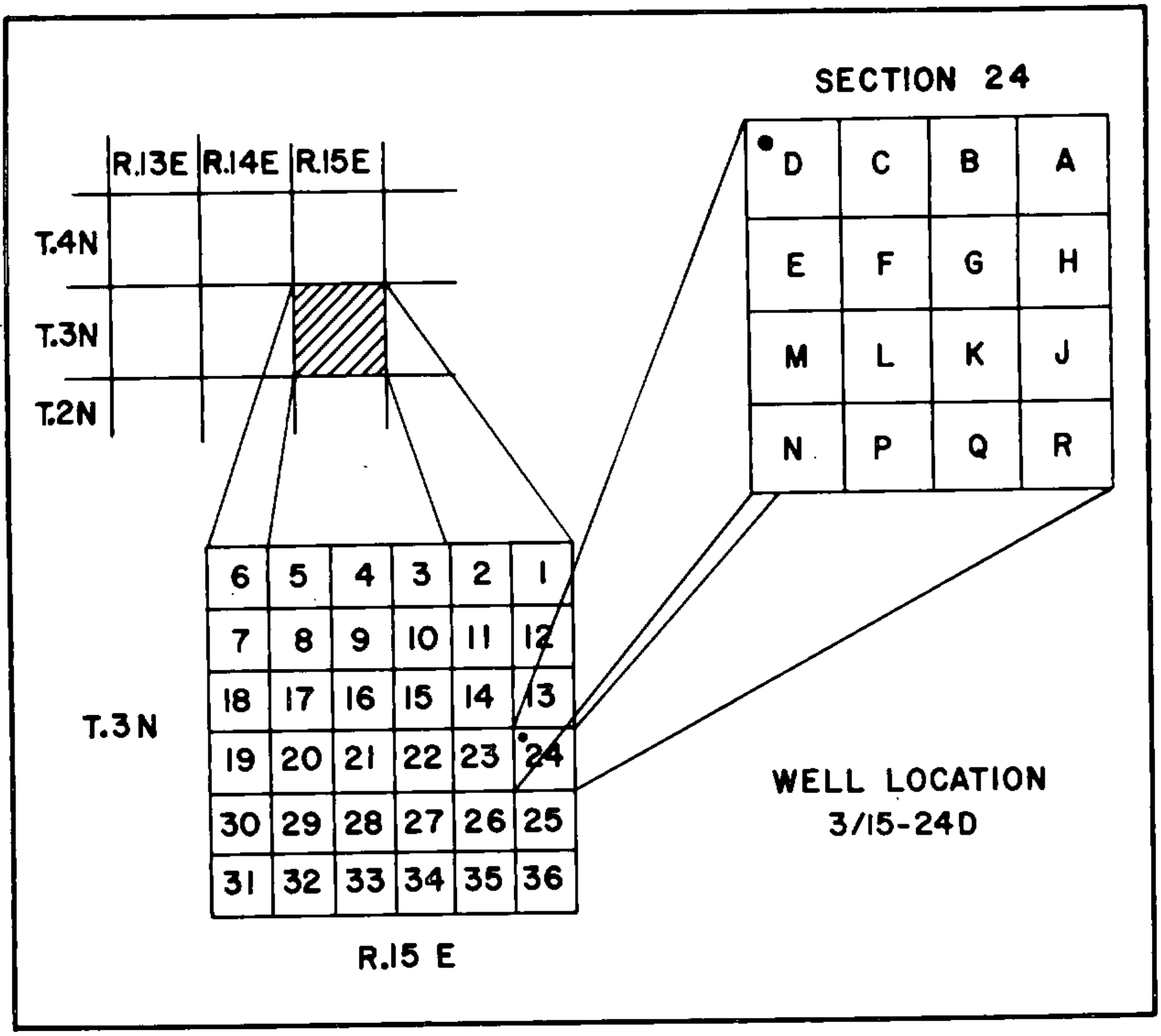

FIGURE 59. Explanation of well location and identification system.

the older would be 3/15-24D1 and the younger would be 3/15-24D2. Springs illustrated on Plates I and II use the same system; however, the number is followed by a lower-case "s" to avoid possible confusion with a nearby well.

Ground-Water Occurrence

In the discussion of reconnaissance geology of the county, four major mappable units were delineated. The map on Plates IV and V shows the surface distribution of these four units and also illustrates the major geologic structures. These principal geological units within the county are also the principal sources of ground water. Some basic premises concerning the availability of ground water in these four units can be established.

Older Volcanics

As previously mentioned, outcrop of the older volcanics is limited to the extreme western part of the county. Much of this part is U. S. Forest Service land and there have been few attempts to locate sources of ground water. In spite of the lack of direct evidence concerning the availability of ground water in the older volcanics, some indirect evidence provides an indication of the unit's water-producing capabilities.

Examination of the older volcanics in hand specimen and in outcrop indicates very compact, dense tuffs and tuff breccias. In addition, reconnaissance of the outcrop areas indicates that few springs issue from the older volcanics and volcaniclastics. The compact nature of the volcanics and the lack of springs in the outcrop areas would suggest that, because of low porosity and permeability, the older volcanics and volcaniclastics are not good ground-water sources. In some areas, however, jointing and fracturing may have produced sufficient secondary porosity and permeability to permit domestic water production. It is possible that some ground water might be available from the coarse sediments that can occur between volcanics and the dense volcaniclastics. The availability of water from these zones would depend upon their lateral variation and their extent.

Columbia River Basalt

Basalts of the Columbia River Group have proved to be substantial ground-water source rocks over much of the Columbia Plateau and are the principal source of ground water for most of Klickitat County. The occurrence of ground water within the basalts is unique in comparison to other water-bearing geological units.

The Columbia River Basalt Group consists of a thick series of basalt flows in which individual flows average 100 feet in thickness and are often separated from each other by tuffaceous interbeds of varying thicknesses. Examination of an individual basalt flow in otucrop reveals most of the flow's central part to be very dense and compact with associated low porosity and low horizontal permeability. This dense central part of the flow, although it may be saturated, is in most cases not a productive zone because of its extremely low permeability.

Near the top of most basalt flows, however, is a much less dense, vesiculated zone with a characteristic honeycomb appearance (Figure 60). This

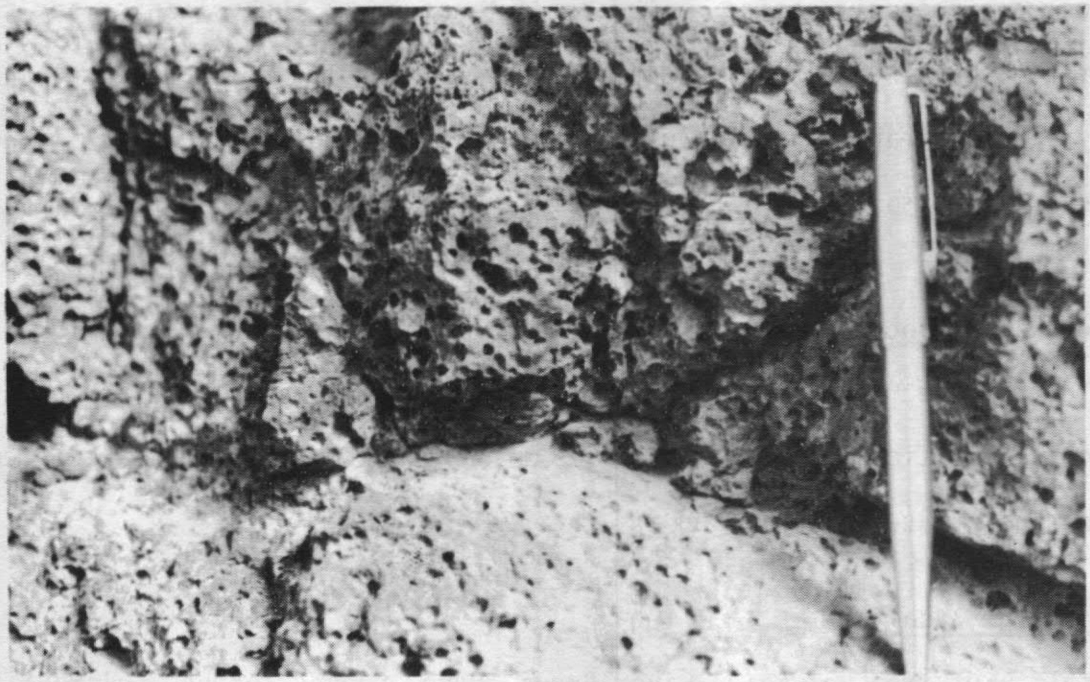

FIGURE 60. Highly porous, vesicular basalt flow top.

zone was formed during the cooling of the molten lava as gases rose to the surface of the flow. As the flow cooled, some of this gas became trapped as bubbles near the flow surface and formed a network of bubble holes. Unlike the bulk of the basalt flow, this vesicular part has high porosity and very high horizontal permeability, which makes these vesicular flow tops and interflow zones excellent aquifers. Sediments interbedded between flows may also produce adequate ground-water supplies if their porosity, permeability and lateral extent are satisfactory.

Although most basalt flows of the Columbia River Group within the county have a relatively large areal extent, the same interflow zone in any two locations may not necessarily produce water. Similarly, the same interflow zone may be an aquifer at different places but the production obtained in two wells penetrating the zone may be markedly different. The principal reason for this inconsistency is lateral variation of permeability of the interflow zone. In some cases the porous interflow zone may thin appreciably over a short distance. Permeability of these porous zones within the basalts also may be affected by secondary filling of pore spaces with clay or other minerals. Thus, whereas sufficient porosity may be present, permeability might be so restricted as to make sustained production nearly impossible.

In addition to lateral variation within the permeable zones, their continuity and distribution may be affected by structure and erosion. Geologic structures such as folds and faults disrupt the continuity of the permeable zones and often act as zones for vertical migration of ground water. If such structures are present between a well and the principal area of recharge, the well may have poor production. Similarly, deep erosional canyons which penetrate several basalt flows can dissect the permeable zone and limit lateral continuity. An example of this lack of continuity can be seen in the Rock Creek basin, where dissection of the basalt surface prevents recharge from distant areas and restricts recharge in the undissected areas to that available from direct precipitation. Thus, in areas of relatively low effective precipitation, the lack of aquifer continuity results in a generally inadequate ground-water supply. Conversely, excellent aquifers may exist in areas of Klickitat County where basalt flows and their related porous interflow zones have sufficient continuity. In the Goldendale area, many shallow irrigation wells (less than 1000 ft) yield 500-800 gpm whereas others yield as much as 1500 to 2000 gpm. In the eastern end of the county, deeper irrigation wells yield 2000 to 3000 gpm.

Tertiary-Quaternary Sediments

The Tertiary-Quaternary sediments are also capable of good ground-water production and, like the underlying basalts, the potential for adequate ground-water production from the sediments is generally tied to their continuity and permeability. Geologic evidence indicates that in many areas the sediments were subjected to erosion prior to their capping by the younger volcanics. Because of this erosion, distribution of the sediments is highly variable and results in continuity problems similar to those of the highly dissected basalt areas.

Permeability in sediments is normally a function of the overall nature of the sediments, including particle size and sorting. In the Goldendale area, these sediments are dominantly coarse sands, gravels and conglomerates, are quite permeable, and occasionally will produce 100-200 gpm. In areas to the south and west, the sediments are finer-grained clays and tuffs and yield only a few gallons per minute in most cases. In general, the best production from the younger sediments is obtained in the area north and west of Goldendale where the permeable sediments underlie the younger volcanics. Substantial production from these sediments has also been obtained in the Swale Creek valley.

Tertiary-Quaternary Volcanics

In some areas of the county, the younger volcanics yield sufficient ground water for domestic and minor irrigation uses. Like the basalts of the Columbia River Group, the olivine basalt and andesite flows of the younger volcanics have porous flow tops and interflow zones which can be productive aquifers. The younger volcanics differ from the Columbia River basalts in that individual flows are much more limited in extent. Furthermore, many of the flows are restricted to linear channels or are otherwise unevenly distributed, thus limiting the distribution and continuity of potential aquifers. The coarse, open diktytaxitic texture of many of the younger basalt flows permits good vertical and lateral migration of water within the flow and may allow for more rapid recharge than possible in Columbia River basalt. For the most part, where there is sufficient continuity and recharge, the younger volcanics are capable of sustaining good domestic water production. In many of the nothern and western parts of the county, the high effective precipitation and the generally porous nature of these flows make them an important domestic source.

Unconsolidated Sediments

In the Camas Prairie area, unconsolidated sediments approach 200 feet in thickness. The sediments extend over a 50-square-mile area and consist of gravels, sands, silts, and clays. As in the case of the other sediments discussed, ground-water production is related to sediment type and distribution.

In the Camas Prairie area wells tapping coarse, highly permeable beds within these sediments are capable of substantial production.

Availability of Ground Water Within the County

Dead Canyon Area

The Dead Canyon area in the eastern end of Klickitat County has recently been found to produce large quantities of ground water for irrigation. The area encompasses Townships 5 and 6 north and Ranges 22 and 23 east. Geology of the Dead Canyon area is characterized by glacial slackwater silts overlying basalts of the Columbia River Group. The uppermost basalt flow is the Elephant Mountain Member, which is thought to underlie almost all of the area. The area is lacking in complicated structure and is typified by a broad gentle slope dipping south from the Horse Heaven anticline to the axis of the Swale Creek syncline. Dead Canyon, Juniper Canyon and several lesser drainages dissect the area but generally do not exceed 200 feet in depth. Much of the area is undissected.

While a few intermittent springs occur in some of the canyons, wells are the only reliable source of ground water in the area. Until recently, the very low population density in the Dead Canyon area meant that relatively few wells were drilled. The existing wells were drilled mainly for domestic and stockwater uses and average 150-200 feet in depth. Production in these wells was normally obtained from the top of the Pomona Member. This suggests that the units above the Pomona Member (the Rattlesnake Ridge Interbed and Elephant Mountian Member) are not likely sources for ground-water production in this area. In some parts of the area, domestic wells have been drilled to the

Selah or Mabton interbeds, at depths of 500 to 600 feet, to acquire adequate domestic water.

In recent years, deep-well irrigation has proved successful, and several large-diameter, high-volume wells are now in production. This indicates that aquifers capable of substantial production are present at depths of 700 to 1000 feet. Analysis of drilling and geophysical well logs from several of these deep wells indicate that production is obtained from interflow zones between flows of the Priest Rapids Member and from similar zones between Frenchman Springs and Priest Rapids Members.

One of the earliest irrigation wells drilled in the area (6/23-15H1) obtained a free flow of 2200 gpm from the interflow zone within the Priest Rapids Member. Comparison of water level information and borehole geophysics for this and a well 10 miles to the southwest (5/22-27A1) led Crosby and others (1972) to suggest that the aquifer was continuous over much of the area. Recent drilling of additional wells indicates that this may be correct.

Water-level measurements in Well 5/23-3A2 (Figure 61) indicate little annual fluctuation. The sudden rise in water level apparent in the summer months of 1976 is not readily explainable but may be caused by recharge of the shallow aquifers associated with the drilling of increasing numbers of deep wells with high positive heads.

The recent increased use of ground water in the Dead Canyon area and the lack of historical records make it difficult to assess the effect of ground-water withdrawal. Conversations with well owners, however, indicate that some decline in head is becoming evident in the area. The limited amount of recharge available suggests that further decline in hydrostatic head might be anticipated as ground-water withdrawals are continued and increased.

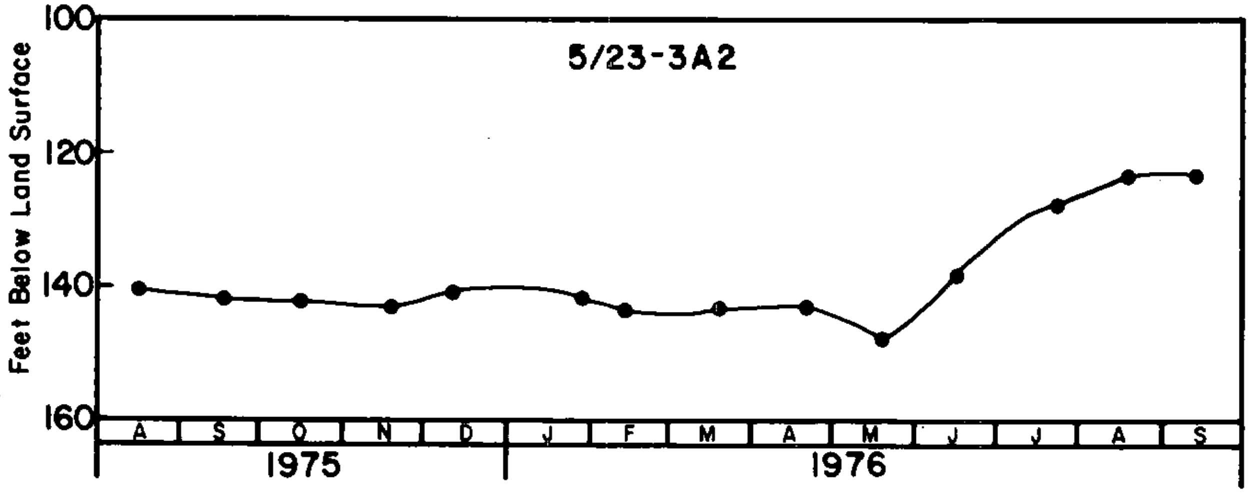

FIGURE 61. Water-level hydrograph, observation well 5/23-3A2, Klickitat County, Washington.

Six Prong Area

The Six Prong area includes much of the Alder Creek drainage basin and the lower part of the Pine Creek and Wood Gulch Basins. The area is dissected by numerous tributary drainages, which results in a series of narrow plateaus separated from each other by deep canyons. The plateaus are normally used for dryland wheat production and the canyons for grazing. The area has a low population density and there is relatively little demand on the ground-water resource. Most ground water is used for domestic and stock needs and is obtained from shallow wells or, to a lesser extent, from springs in canyon areas. Like the Dead Canyon area, many domestic wells tap interflow zones associated with the Selah or Mabton interbeds. In some locations, the intense dissection of the area creates water supply problems, and attempts to develop wells are often unsuccessful because of the limited lateral continuity of the shallow aquifers. Water can usually be obtained, however, if the wells are drilled to levels below the bottom of the canyon. Depending upon the location of these wells, static levels can often be quite low.

In general, there is minimal irrigation activity in the Six Prong area, principally because the area's rugged topography limits irrigation feasibility. In the lower part of Alder Canyon, however, recent attempts to obtain large amounts of water from deep wells has proved quite successful, and substantial crop irrigation is now being attempted. Most of the irrigation wells have been drilled to the top of the Priest Rapids Member or below (800-1000 ft) and obtain substantial quantities of water from interflow zones within the Priest Rapids or Frenchman Springs members. Most have high static water levels and one (5/23/29D1) is free-flowing in excess of 2000 gpm.

Bickleton Area

The Bickleton area includes the upper end of the Alder Creek basin and the central and northern parts of Pine Creek and Wood Gulch basins. In this area, stream dissection is much less severe than in the Six Prong area, and much of the Bickleton area comprises a level, gentle southward-dipping plateau. This level plateau area lends itself to dryland farming and, accordingly, much of the population in eastern Klickitat County is located in and around the town of Bickleton.

Although the subsurface geology of the Bickleton area appears to be very similar to that of the Dead Canyon area, the hydrology of the two areas is remarkably different. Drilling information and borehole geophysics indicate that the interflow zones associated with the Selah and Mabton interbeds are the principal sources for domestic water in the Bickleton environs. The Selah interflow zone is generally a poor producer and most good domestic wells are drilled to the Mabton (300-400 ft). In isolated cases, the Mabton interbed is compatible with moderate (500 gpm) irrigation production.

Subsurface information indicates that units similar to those found in the Dead Canyon area exist in the Bickleton area and that similar zones of high porosity are present. Attempts to obtain water from interflow zones between Priest Rapids flows or between the Priest Rapids and Frenchman Springs members have resulted in very low hydrostatic heads and productions on the order of a few tens of gallons per minute. Well 5/22-27C1 was completed to a depth of 900 feet, had a static level of 750 feet below land surface, and did not produce sufficient irrigation water.

Measurement of water levels in the Bickleton area has revealed considerable information on the area's hydrology. As previously mentioned, domestic wells in the area vary in depth and tap different stratigraphic intervals. In spite of this, water levels from almost all wells appear to define a single surface which is, in most places, within a few tens of feet of the ground surface. This relationship appears to hold over most of the Bickleton area with one noticeable exception. In the southwest part of T. 6 N., R. 21 E., and the northwest part of T. 5 N., R. 21 E., there is an area where aquifers associated with successively lower stratigraphic intervals between the surface and the top of the Priest Rapids Member exhibit progressively lower hydrostatic heads. The abruptness of the change is apparent in comparing the depths and water levels of wells 6/20-36B1, 6/21-31F2 and 6/21-31F4. These wells are drilled to similar stratigraphic levels except for 6/21-31F2 which terminates about 50 feet higher than the other two. Well 6/20-36B1 is about 0.5 miles west of and 40 feet higher than the other two. Well 6/20-36B1 is about 0.5 miles west of and 40 feet higher in elevation than 6/21-31F2 and 31F4. The static water level in 6/20-36B1 is about 12 feet from land surface, in striking contrast to that of wells 6/21-31F2 and 31F4. Water levels in these latter wells are 197 and 270 feet below land surface, respectively. In addition to the striking difference in water levels, the anomalous area has a history of poor production, even for domestic supplies. This anomaly in hydrology is probably related to a permeability change, but the cause of the change is unknown.

Water-level measurements in the Bickleton area wells also reveal that a substantial head change occurs between wells which terminate above the Priest Rapids Member and those which penetrate the Frenchman Springs Member. Only two wells, 5/22-27C1 and 6/21-19Q1, have been drilled below the Priest Rapids, but both have reported static water levels of 700 feet or greater below land surface. Information obtained from conversations with area residents suggests that a zone of intermediate head may exist in wells which penetrate part of the Priest Rapids Member but which do not penetrate the Frenchman Springs Member.

Monthly water-level measurements in selected wells indicate that annual fluctuation varies among the wells and depends upon their depth and location. Some of the hydrographs also suggest that an overall decline in ground-water levels is occurring. In the immediate area of the community of Bickleton, water-level information is available from two wells. Well 6/20-22D1 has been measured regularly by the U. S. Geological Survey and provides the longest available record for the area. This well is reported to be 44 feet deep, which means that it bottoms somewhere in the Pomona flow. During the last three years, the hydrograph (see Figure 62) appears to indicate an overall decline in water level, with recovery during winter and early spring months not equaling that of previous years. Unfortunately, only two measurements were made in 1974 and 1975 and these may present a distorted picture. The

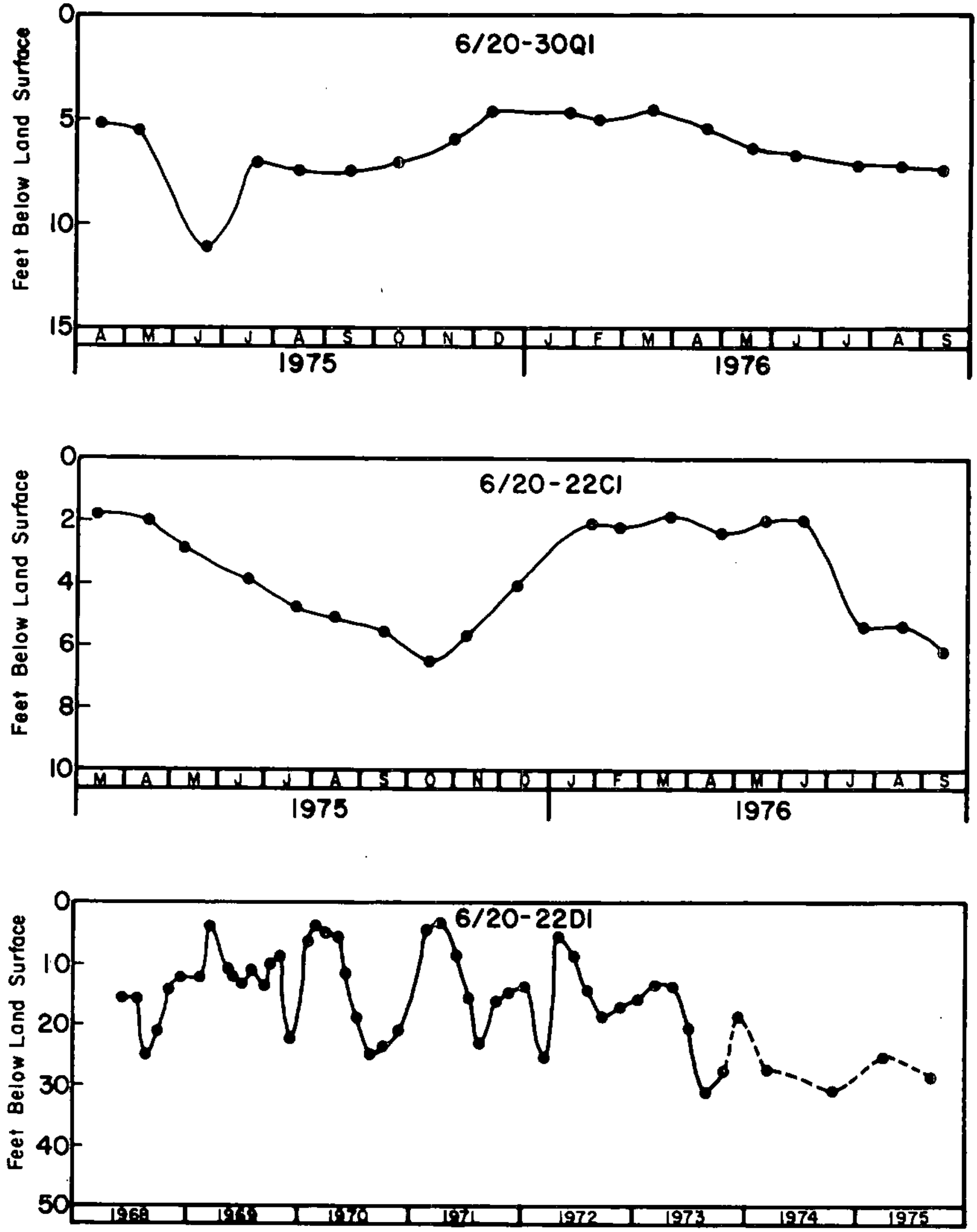

FIGURE 62. Water-level hydrographs, observation wells 6/20-30Q1, 6/20-22C1, and 6/20-22D1, Klickitat County, Washington.

twice-yearly measurements were made, however, in the early spring and in the fall and should approximate the annual maximum and minimum for the well. If the measurements for 1974 and 1975 can be taken as representative, an overall decline of about 20 feet has taken place over the last four years. In contrast, well 6/20-22C1, located only two blocks to the east, indicates little overall decline in 1975 and 1976. This well is about 100 feet deeper than 6/20-22D1, has a relatively high static water level, and displayed good annual recovery for the 18 months during which it was measured. Monthly water levels are also available from the two wells in the earlier mentioned anomalous area. Hydrographs of both wells (Figure 63) show a net decline in water levels over the period of measurement with declines being most pronounced in 6/21-31F4. Similarly, measurements made in 6/21-34N1 (Figure 63) also indicate an overall decline during the period of measurement.

The apparent decline in these Bickleton area hydrographs may be a result of higher than normal precipitation in 1975 followed by much lower than normal precipitation in 1976 rather than a decline caused by ground-water use. This explanation seems unlikely, however, for two reasons. One is that, although annual precipitation for the Bickleton area during 1976 was about one-half of normal, most of the deficit occurred in the fall and early winter months, after the final water-level measurement. Weather Bureau records show the 1976 annual precipitation to be 6.93 inches, in contrast to normal annual precipitation of 13.04 inches. However, the records also show that by the end of September 1976, the last month of water-level measurements, precipitation was only 1.83 inches behind normal. The records indicate that yearly fluctuations from two to three inches are not uncommon, and it seems unlikely that such fluctuations would have such an immediate effect upon the deeper ground-water zones.

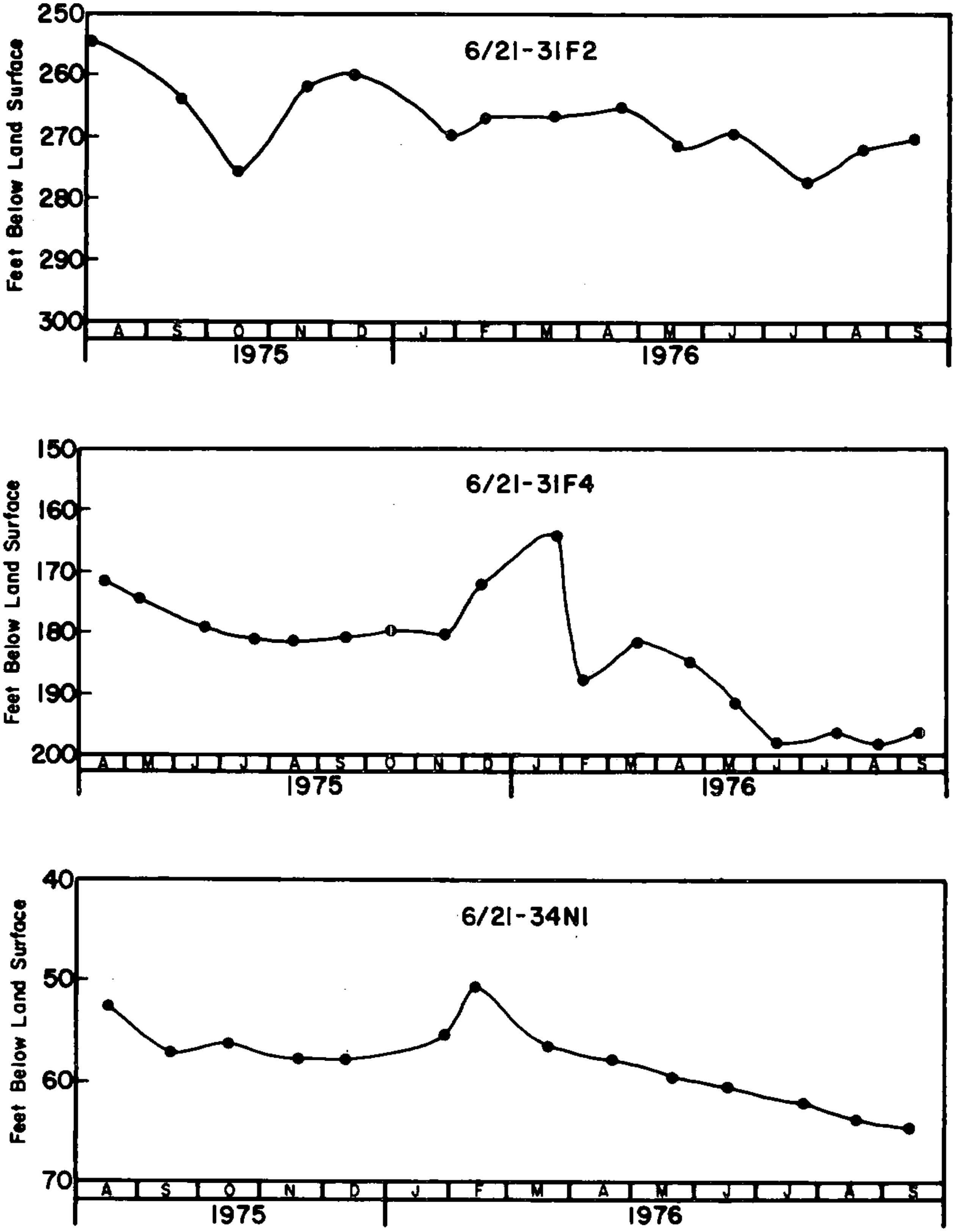

FIGURE 63. Water-level hydrographs, observation wells 6/21-31F1, 6/21-31F4, and 6/21-34N1, Klickitat County, Washington.

The second line of evidence that the water-level decline may not be a direct result of variations in precipitation is that such variation should produce a more profound effect upon the shallower wells. Such an effect is not noticeable. The Cleveland well (6/20-30Q1) is only 14 feet deep and depends on direct annual recharge. Still, it exhibits relatively little annual fluctuation and no overall decline. If annual precipitation varied enough to affect recharge, the effects should be evident in the hydrograph of this well.

Continuation of declining water levels could have far-reaching effects upon the Bickleton area. If the aquifer associated with the Mabton interbed ultimately were to be dewatered, production would most likely have to come from much deeper zones in the Priest Rapids and Frenchman Springs members. To date, efforts to increase ground-water production for the Bickleton area from these lower zones have been discouraging. Drilling information does suggest that adequate domestic water may be available; however, the depressed hydrostatic head associated with these lower aquifers would require much greater pump lifts.

Rock Creek Area

West of the Bickleton and Six Prong areas, the Rock Creek drainage basin occupies a large part of east central Klickitat County. Because of its large size and its definite geographic boundaries, the land drained by Rock Creek and its tributaries lends itself to a natural subdivision for ground-water discussion. The Rock Creek area extends from the Horse Heaven Hills in the north to the Columbia River in the south and its deeply incised drainages produce very rugged relief over most of the basin. The eastern half is largely uninhabited and used mainly for dryland grazing. West of Rock Creek, the area is somewhat less dissected and the flat areas drained by Luna Gulch and Badger Gulch are farmed. In the higher areas to the north, grazing and logging are the primary land uses.

Very little ground-water information is available for much of the Rock Creek area, particularly the eastern and northern part. Virtually no wells have been drilled in these areas and most of the ground water used comes from isolated springs. In the north, the density of springs appears to increase.

A few domestic wells have been drilled in the Pleasant Valley area between Rock Creek and Luna Butte. Most of these are from 100 to 300 feet deep and most furnish adequate domestic supplies. In general, little well irrigation is attempted in the area; however, well 4/18-17K1 was drilled for irrigation purposes. This well is apparently typical of most attempts to secure irrigation water in this area. The well was reportedly deepened twice and is currently about 780 feet deep. It presumably taps aquifers in the Frenchman Springs Member. Currently, the well will sustain a production of 600 gpm for about one day before the pump breaks suction. The owner reports that it is then several days before the well can again be used. The drilling and pumping history of this well characterizes the inadequacy of ground-water supplies for irrigation applications. This undoubtedly is a result of restrictions on recharge resulting from the heavy dissection of the surface by Rock Creek and its tributaries and by the structural discontinuity produced by the Luna Butte anticline.

Goldendale-Centerville Area

In central Klickitat County, the Goldendale-Centerville area consumes the largest quantity of ground water of any area in the county. This area extends from the Horse Heaven Hills to the Columbia Hills and is bounded on the east by Luna Butte and on the west by the main Klickitat River canyon.

The area slopes gently to the south, conforming to the dip of the underlying basalt bedrock, from the Horse Heaven anticline to the Swale Creek syncline near the southern edge of the area. The general flatness of much of the southern part of the area lends itself well to irrigated crops such as alfalfa and wheat. Irrigation and the high population density account for substantial ground-water withdrawal.

Drilling information and borehole geophysics indicate that most of the ground water is obtained from porous interflow zones between the thick flows of the Frenchman Springs Member of the Columbia River Basalt Group. Geophysical logs from wells 4/16-16Q2 and 3/16-18D3 indicate that the interflow zones associated with the Vantage interbed may also be productive. Numerous domestic wells are 200-300 feet deep; however, in many areas much shallower wells provide adequate ground-water supplies. Irrigation wells are somewhat deeper, though few exceed 500 feet in depth and, to date, no wells have been drilled deeper than 1000 feet. Irrigation well production is normally about 500 gpm with a few of the deeper wells capable of producing 1000-1500 gpm.

In the area north and west of Goldendale, where younger volcanics are present, adequate domestic supplies are obtained from the younger volcanics and the underlying sediments. Wells within the younger volcanics must be drilled to depths of several hundred feet to reach water and, in many cases, they probably are drilled into the underlying sediments and/or into Columbia River Basalt. The very coarse, open texture of the younger volcanics apparently facilites rapid vertical movement of water. Incidents of heavy rains resulting in a sudden muddying of water in wells several hundred feet deep have been reported. Whereas the open texture of the younger basalts may reduce their productive capabilities, it probably is beneficial to the underlying aquifers in the Columbia River Group through rapid recharge.

In some areas, the Tertiary-Quaternary sediments present between the Columbia River Basalt Group and the younger volcanics are adequate aquifers. Generally, the productivity of these sediments is directly related to sediment size and sorting and the related permeability. Where the sediments are primarily coarse sands and gravels and are extensive, well productions of up to 150 gpm are reported. In areas where the sediments are predominantly silts, clays, and tuffs, production is poor.

A similar relationship is evident in the Swale Creek valley sediments where many shallow domestic wells yield adequate supplies. Occasionally, wells in the coarse sediments will produce in excess of 100 gpm.

As is the case in the Bickleton area, water-level measurements in the Goldendale-Centerville area reveal considerable information on subsurface hydrology. Water-level contour maps based on mass water-level measurements were constructed. Wells from which measurements were obtained are of varying depths and tap aquifers associated with different stratigraphic intervals. However, with only a few exceptions, all wells have static levels which define a relatively uniform surface and most have static levels within a few tens of feet of the surface. The exceptions are the deepest wells in the area which appear to penetrate a lower system. A good example of the apparent interconnection of producing zones within the upper 500 feet and the abrupt change to the potentiometric surface of a lower zone is illustrated by the hydrogen of well 4/15-16F1 (Figure 64). This well has piezometer tubes set at four different depths and stratigraphic intervals. The top three, representing a total depth of 440 feet, have almost identical static water levels. The

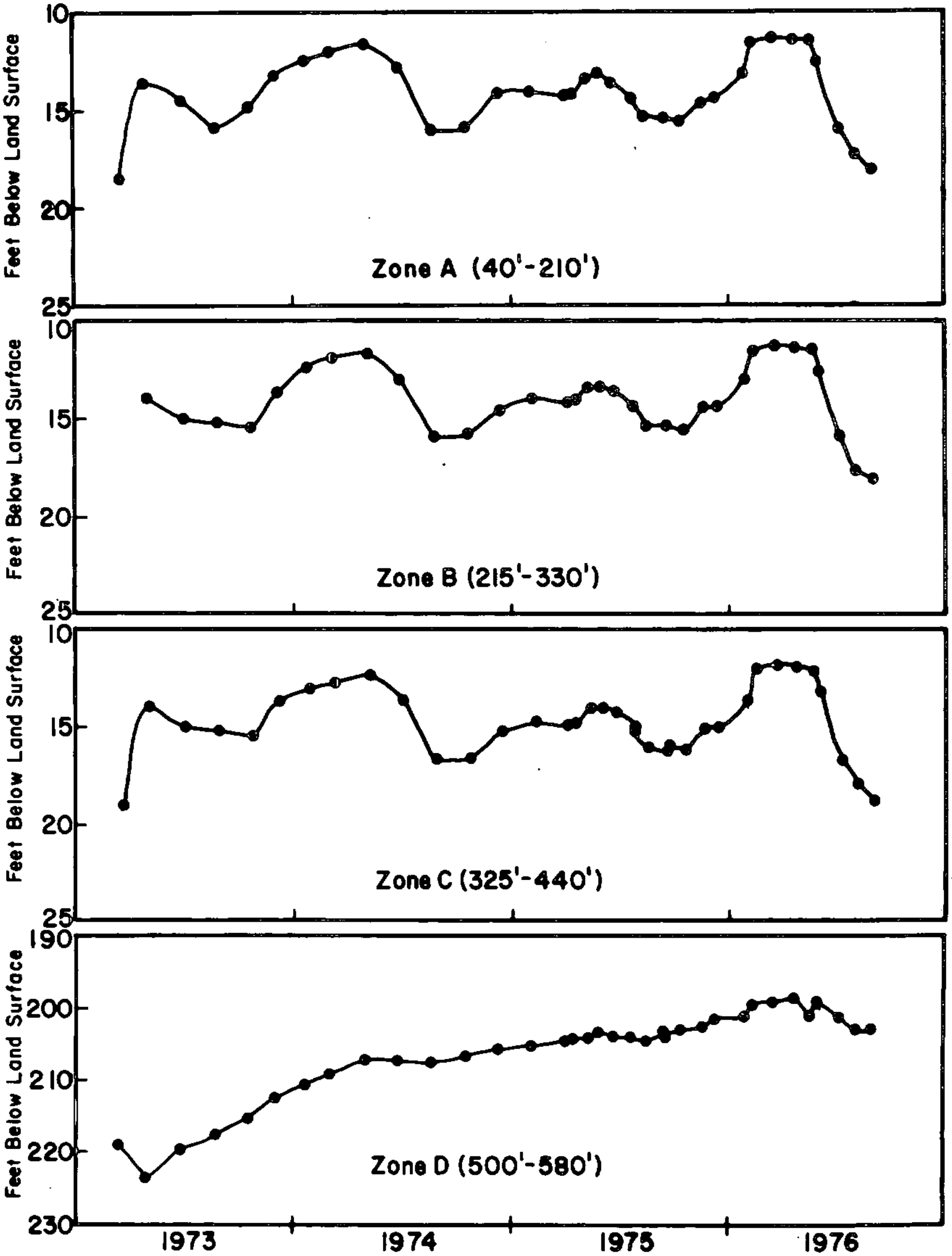

FIGURE 64. Water-level hydrographs, Blockhouse observation well (4/15-16F1), Klickitat County, Washington.

fourth zone (500-580 ft) has a much different water level which is about 200 feet lower than that of the upper three zones.

The mass water-level measurements were taken in early spring and late fall for two successive years, partly in an effort to determine what effect ground-water withdrawals in the Goldendale-Centerville area were having on water levels. Examination of Figures 65 through 68 indicates that although some slight change is noticeable from spring to fall, there is no evidence of a major change. Comparison of these figures with water-level contours prepared by Luzier (1969) indicates that little change has taken place since the mid-1960's when Luzier's data were collected.

The lack of significant changes in the water levels seem to be apparent in both the long-term and short-term hydrographs presented in Figures 69 through 72. Most hydrographs show annual recoveries to levels of the previous years. Even the hydrographs of Figure 72, which represent water-level data collected since 1958, show recovery to common levels each year. These long-term hydrographs do illustrate, however, the effects of increased seasonal withdrawals during the last few years. These effects appear as greater annual fluctuations of the water levels.

Water-level measurements from well 4/16-16F1 appear to be of particular interest (Figure 64). As previously discussed, the water levels associated with the upper three zones appear to conform to those of nearby wells and fit into the contoured surface presented in Figures 65 through 68. Water levels of zone D, however, are much lower and are not directly related to the upper zones. Water-level measurements made of zone D since 1973 indicate a gradual increase in hydrostatic head during the last three years. This head increase is not well understood but may be in response to vertical leakage

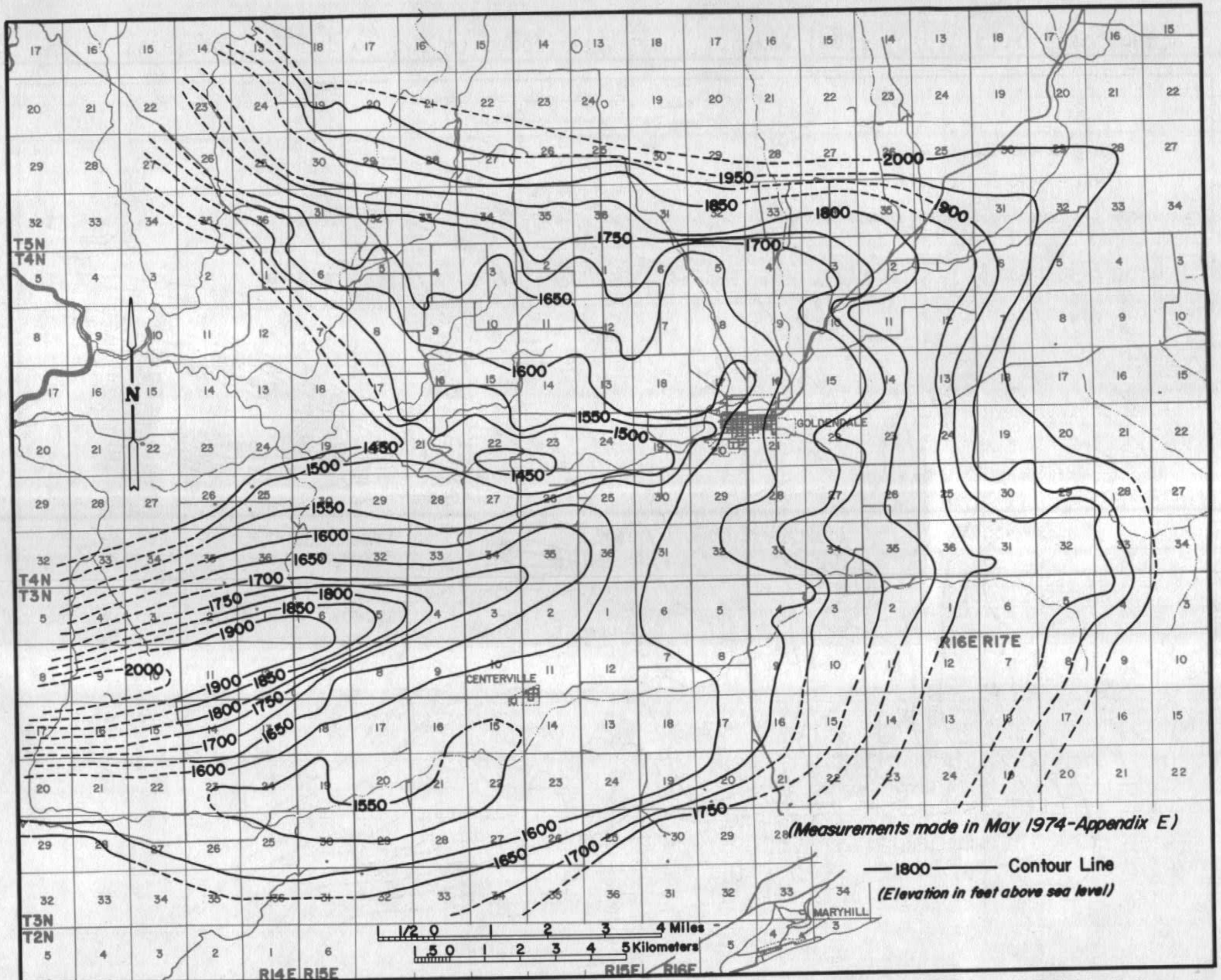

FIGURE 65. Water-level contour map of the Goldendale-Centerville area (Spring 1974), Klickitat County, Washington.

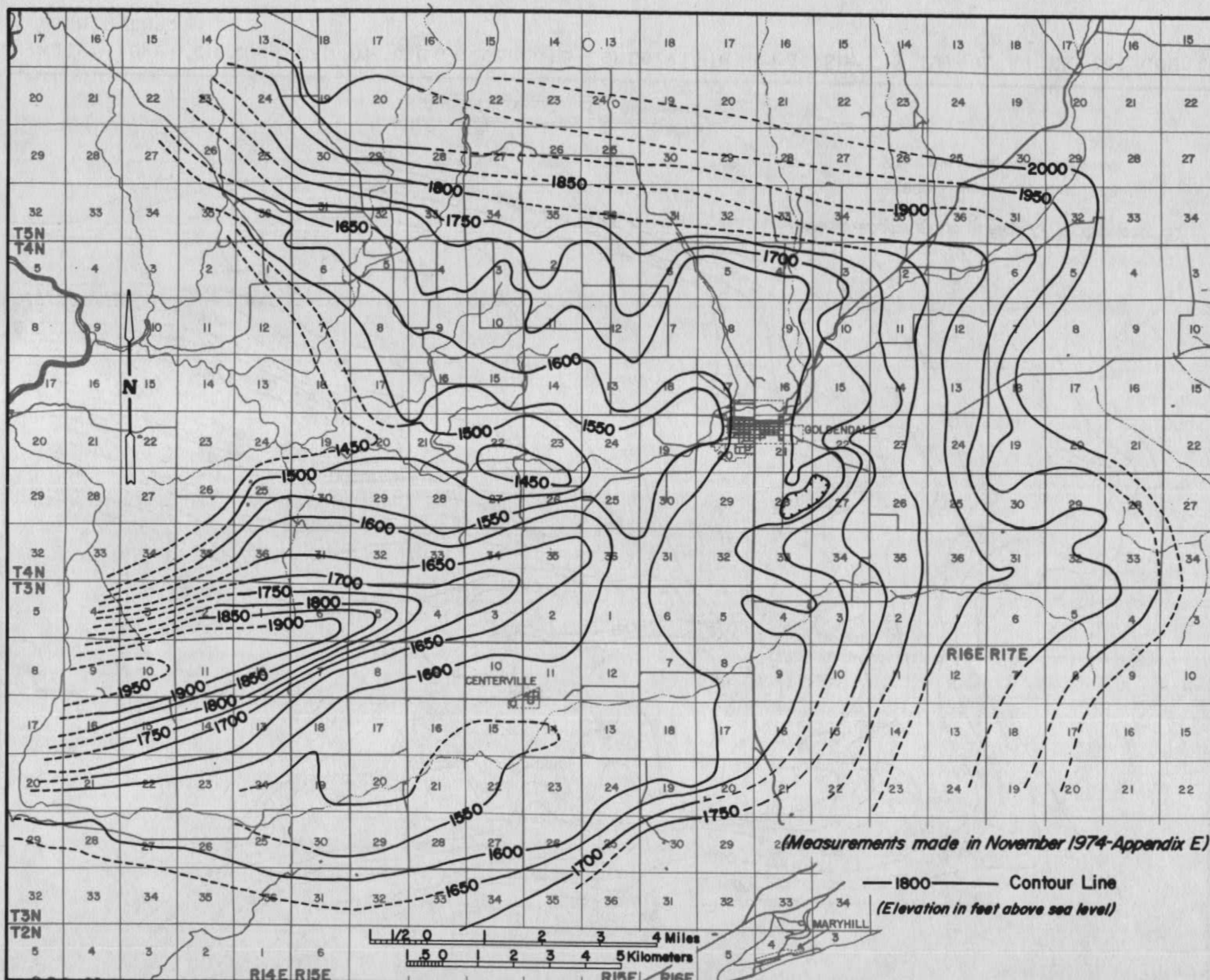

FIGURE 66. Water-level contour map of the Goldendale-Centerville area (Fall 1974), Klickitat County, Washington.

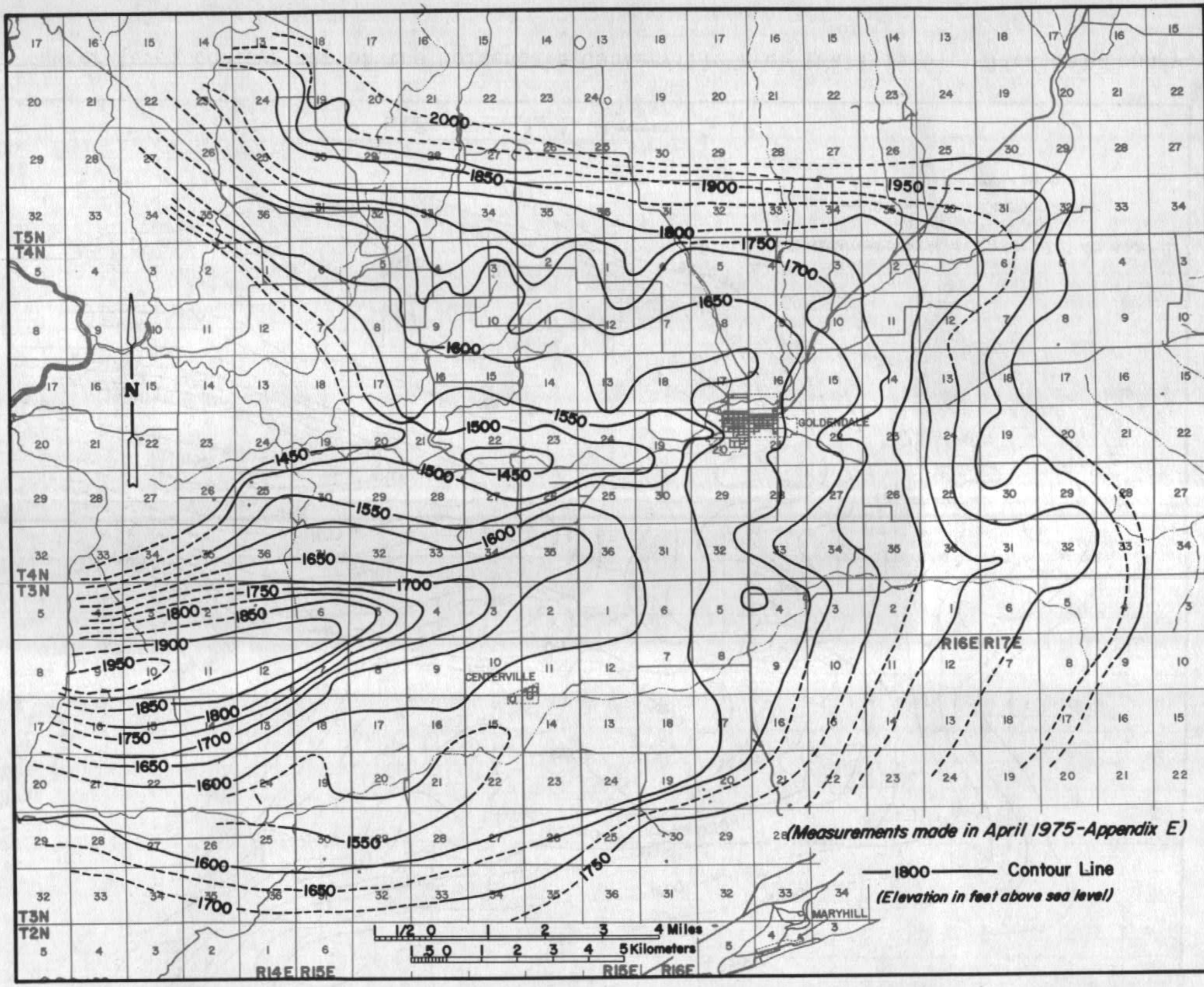

FIGURE 67. Water-level contour map of the Goldendale-Centerville area (Spring 1975), Klickitat County, Washington.

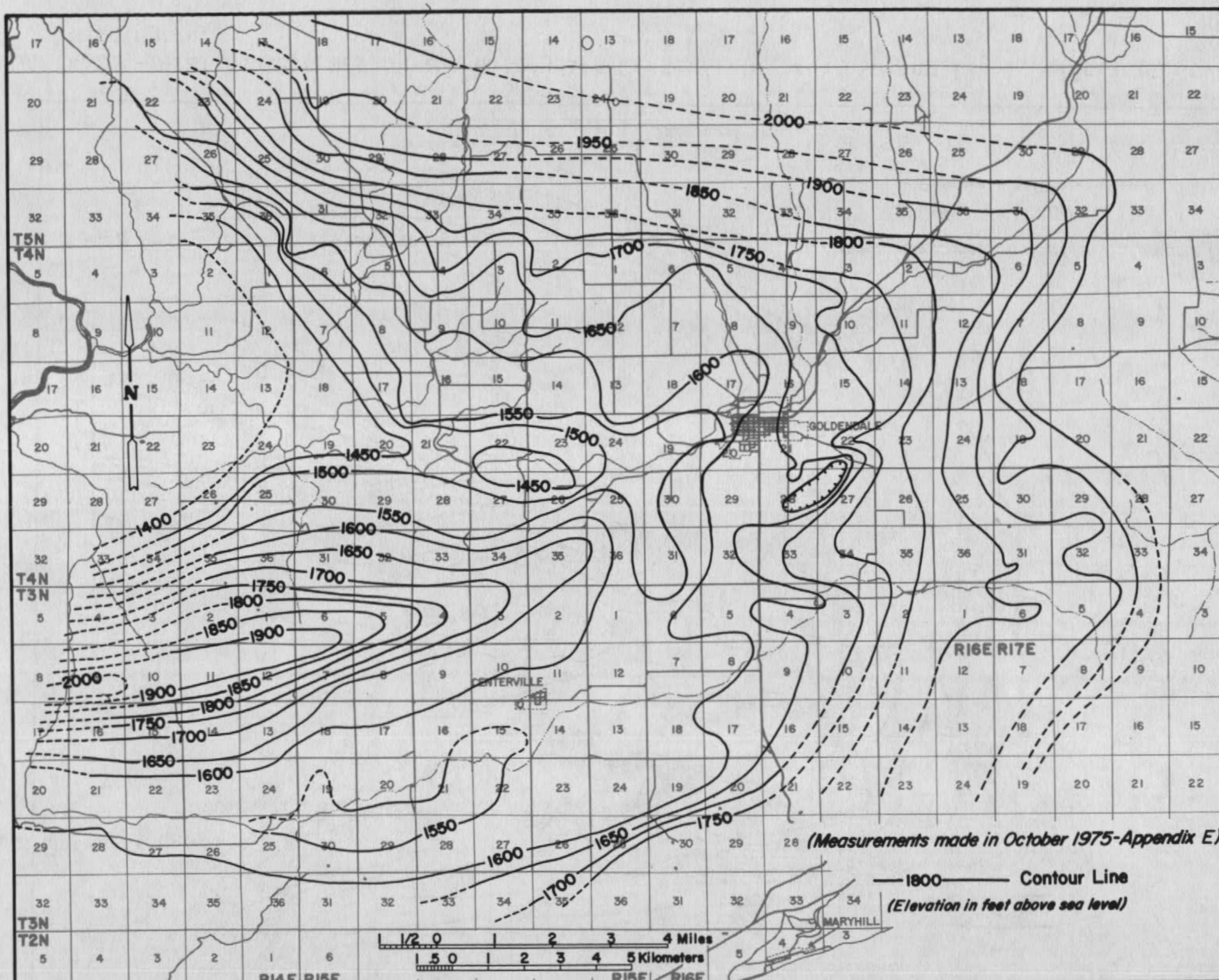

FIGURE 68. Water-level contour map of the Goldendale-Centerville area (Fall 1975), Klickitat County, Washington.

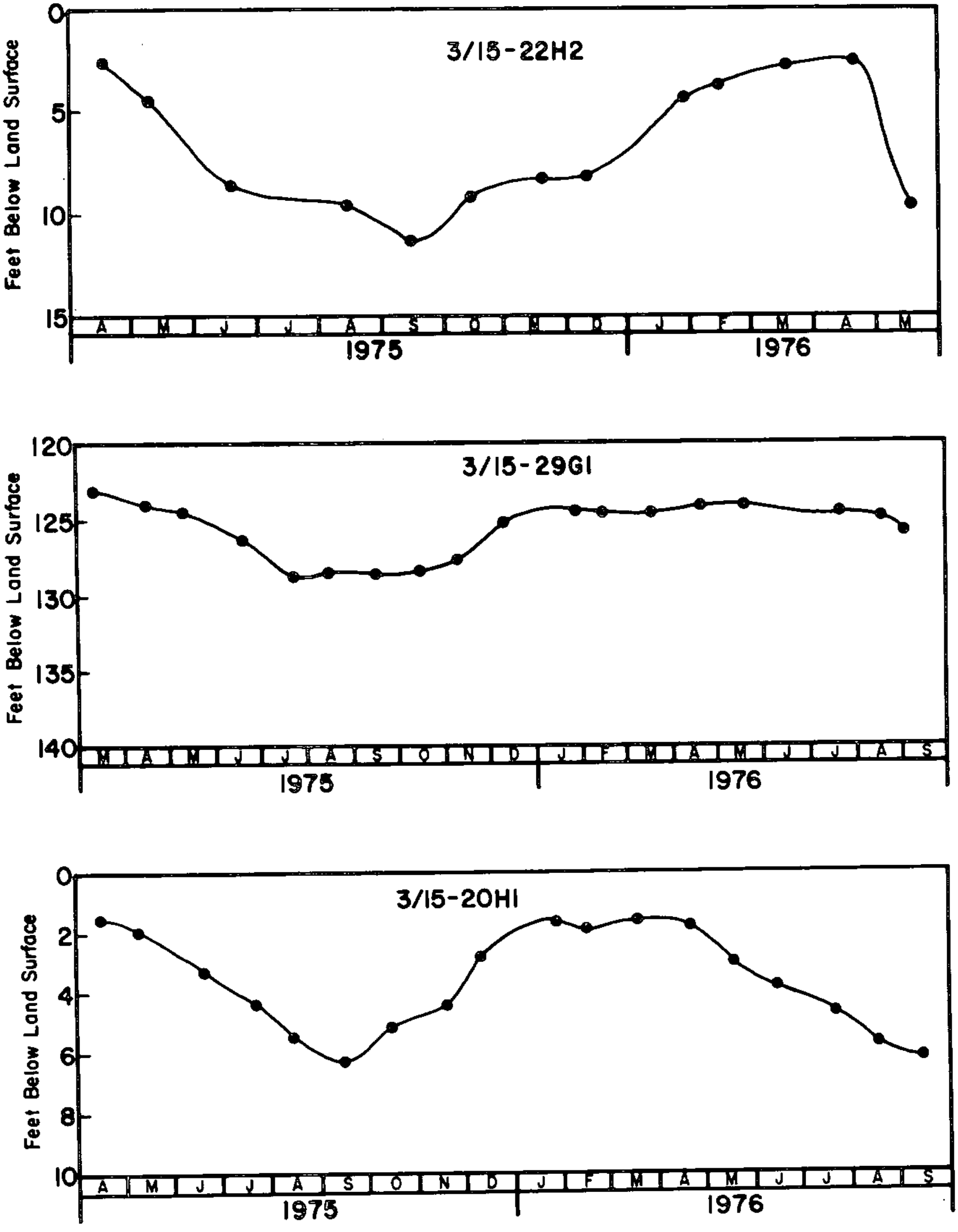

FIGURE 69. Water-level hydrographs, observation wells 3/15-22H2, 3/15-29G1, and 3/15-20H1, Klickitat County, Washington.

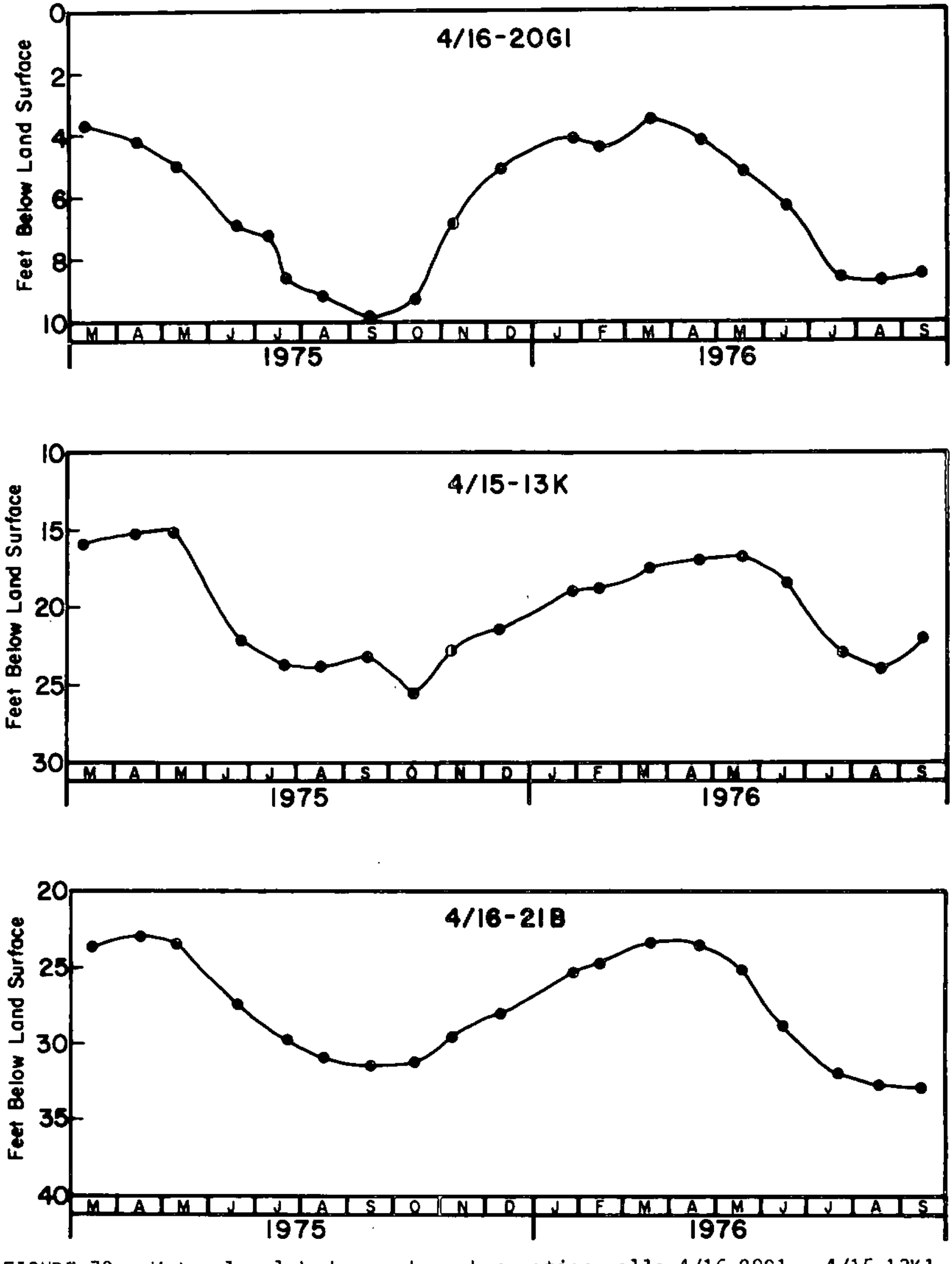

FIGURE 70. Water-level hydrographs, observation wells 4/16-20G1, 4/15-13K1, and 4/16-21B1, Klickitat County, Washington.

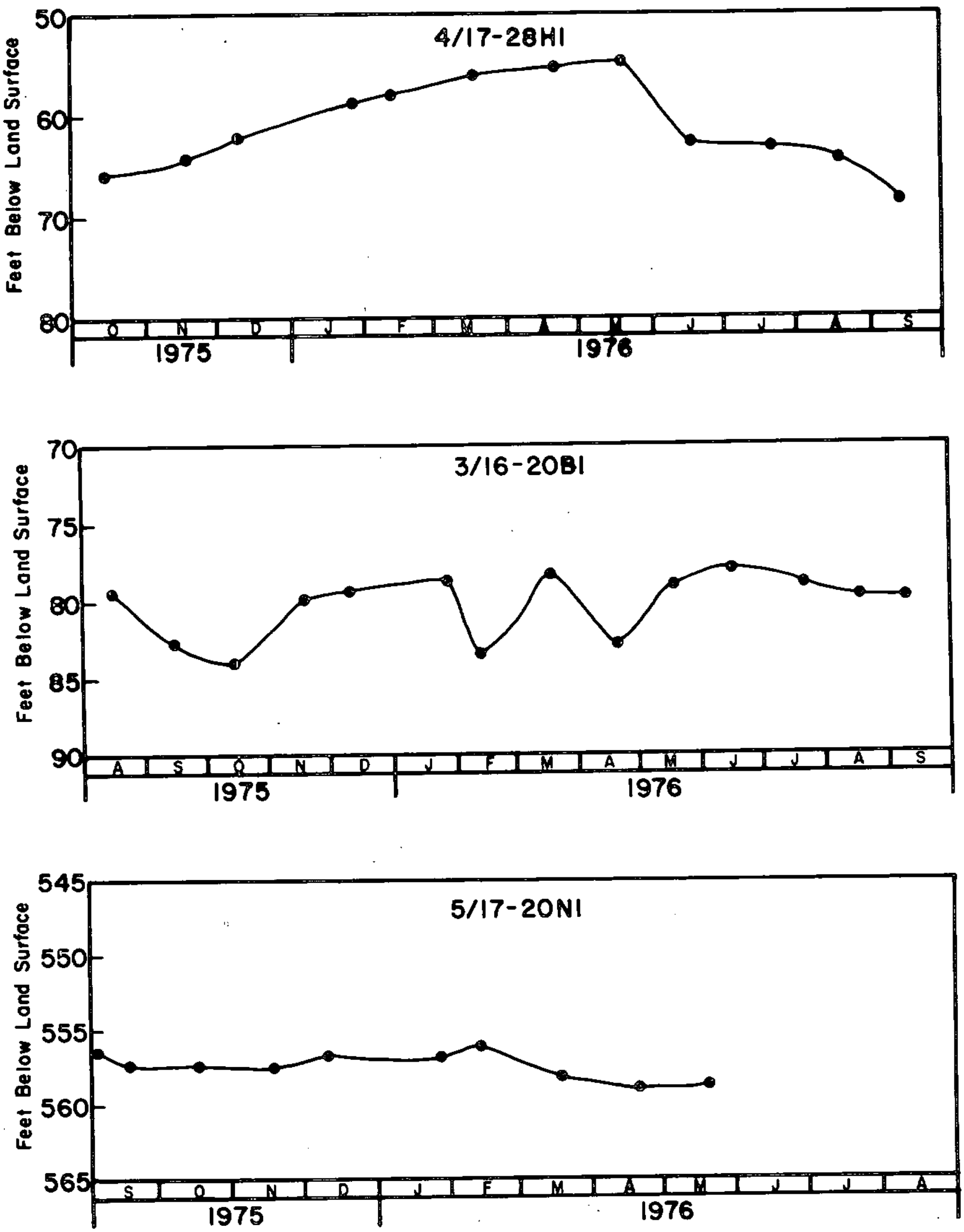

FIGURE 71. Water-level hydrographs, observation wells 4/17-28H1, 3/16-20B1, and 5/17-20N1, Klickitat County, Washington.

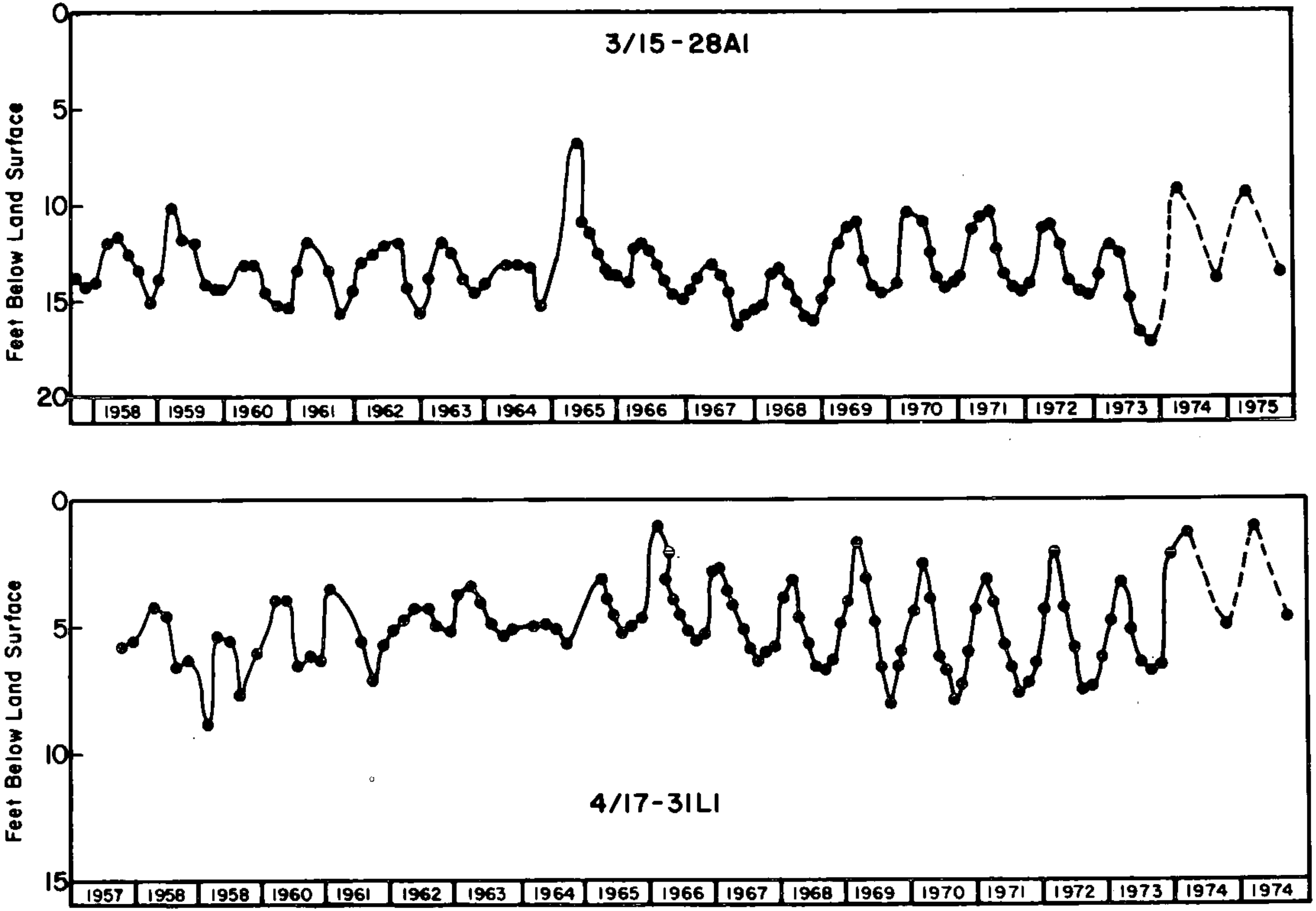

FIGURE 72. Long-term water-level hydrographs, observation wells 3/15-28A1 and 4/17-31L1, Klickitat County, Washington.

associated with the increasing number of wells. The head increase also may reflect a gradual stabilization of the aquifer since well construction.

For some time, the minor northwest-trending structural lineaments of the area were thought to have a significant effect upon the distribution and availability of ground water in the Goldendale-Centerville area. In fact, hydrologic evidence has been used to support the concept that these lineaments are faults. Results of mapping, mentioned earlier, indicate that these structures are folds and that there is little direct evidence of faulting. Borehole geophysical logs of wells in a line perpendicular to the trend of lineament reveal little evidence of structural or hydrologic discontinuity except in the immediate area of the small anticlinal folds. The geophysics indicate no vertical offset of stratigraphic units and show that vertical fluid movement between the same zones is characteristic of wells on either side of one of the projected lineaments. Similarly, contouring of the mass water level information suggested that the contour lines crossed the lineaments without interruption.

While the structures do not appear to have a substantial effect on the hydrology of the area, some local subsurface damming may occur in the immediate proximity of these folded structures. Well 4/15-26A1, a flowing well at the base of Snipes Butte, may reflect such a local damming effect. Several other wells in this area flow intermittently, however, and the flow may be attributable to well-head elevations that are lower than the regional water surface during recharge months.

A group of flowing artesian wells is present in the Little Klickitat canyon, northwest of Goldendale, in Sections 2, 10, and 11 of T. 4 N., R. 16 E. The reason for the high heads in these wells is not fully understood. However, it may result from a combination of the low elevation of the valley relative to the surrounding area, and to the presence to the south (down gradient) of an apparent deep channel filled with younger volcanics.

In general, adequate supplies of ground water are available in most locations of the Goldendale-Centerville area. Production is poor in some of the younger volcanics near Goldendale, apparently because of the restricted nature of the younger basalts. Other areas where well production does not seem adequate are the Horseshoe Bend area west of Goldendale and the High Prairie area between the Swale Creek and Klickitat River canyons. Production in these areas is poor probably because they are isolated by relatively deep canyons. This isolation limits aquifer continuity and restricts recharge to only that available within the area.

For most of the Goldendale-Centerville area, adequate domestic and irrigation supplies can be obtained a few hundred feet below surface in the Frenchman Springs Member. In many areas, irrigation wells between 500 and 1000 feet in depth have produced 1000 to 2000 gpm. This is particularly true of the Swale Creek valley near the axis of the Swale Creek syncline.

Camas Prairie-Upper Klickitat Basin Area

Camas Prairie consists of unconsolidated sediments, primarily gravel, sand and clay, which overlie volcanic bedrock. Total thickness of these deposits is not known; however Cline (1976) reports them to be about 100 feet deep in the southern part of the prairie. The age and nature of the underlying bedrock is not known; however, outcrops surrounding the Camas Prairie include both Columbia River Basalt and younger olivine basalt, and it seems likely that these same rocks are present beneath the sediments.

Ground-water use in the Camas Prairie area is restricted principally to domestic and stock-water needs. Pastures are extensively irrigated, but this water is obtained from tributaries to the Klickitat River delivered via Hellroaring Ditch.

There are numerous small springs in the hills surrounding the prairie and several large springs along the lower reaches of Outlet Creek and in the Klickitat River Canyon just north of its confluence with Outlet Creek. Cascade Spring (6/13-10R/s) reportedly discharges 18,000 gpm into Outlet Creek and with several other nearby springs combines to produce about 100 cfs increase in the flow of Outlet Creek (Cline, 1976). Several large springs on the east side of the Klickitat River also produce substantial quantities of water and supply the state salmon hatchery east of Glenwood. McCumber Spring (3-1/2 miles north of Glenwood) has been developed as a water supply for the Glenwood area and is estimated to yield about 1800 gpm.

The numerous springs and abundant surface-water resources have limited well drilling in the Camas Prairie area. In addition, development of a water system in the Glenwood area and recent expansion of the Conboy Wildlife Refuge have resulted in the removal of many existing wells from active service.

Wells on Camas Prairie normally obtain water from either the unconsolidated sedimentary deposits or the underlying basalt aquifers. The variable nature of the unconsolidated sediments results in highly variable permeabilities and a wide range of production capabilities, reported by Cline (1976) to vary from 0 to 500 gpm. Cline suggested that in some areas production in excess of 500 gpm might be obtainable for limited time periods. In many areas, shallow wells dug in the sediments produce adequate domestic supplies.

The aquifer system underlying the unconsolidated sediments is associated with the basaltic bedrock. As is the case elsewhere in the basalts, ground water is normally obtained from interflow zones between basalt flows. To date, most of the production from the basalts of the prairie has been for domestic and stock use and is moderately small. It seems likely, however, that large production could be obtained from the basalt aquifers should it ever become desirable.

The occurrence of two distinctively different producing materials in the Camas Prairie area brings about two distinctive hydraulic systems. Water levels in area wells depend upon which system the well penetrates. Two observation wells were established in Glenwood to monitor the two systems. Well 6/12-10P1 is a shallow dug well, the hydrograph of which (Figure 73) reflects the annual fluctuations of the water level in the unconsolidated deposits. The somewhat bimodal appearance of the well hydrograph probably reflects recharge occurring with the start of the irrigation season. In general, water levels of wells in the unconsolidated sediments are within a few tens of feet of the surface.

Well 6/12-10K1 derives water from the underlying basalt and its water level is indicative of the deeper wells. Cline (1976) reports the water surface of this lower aquifer system to be at an elevation of about 1700 feet with a gentle slope to the north and east. Examination of the hydrograph of 6/12-10K1 in Figure 73 reveals that, in contrast to many wells, the water level rises to its highest point during the late summer months and, conversely, reaches its lowest point in mid-winter. This may be a result of the lag time involved for annual changes in precipitation to be reflected in the deeper system. The well also may be responding to recharge from irrigation in the area which would be active during the summer months and discontinued during the winter. Study of the well hydrograph indicates that an apparent overall decline in the water level occurred during the three years in which water-level measurements were made. Whether this is indicative of any long-term trend is not known, but with the amount of precipitation available to

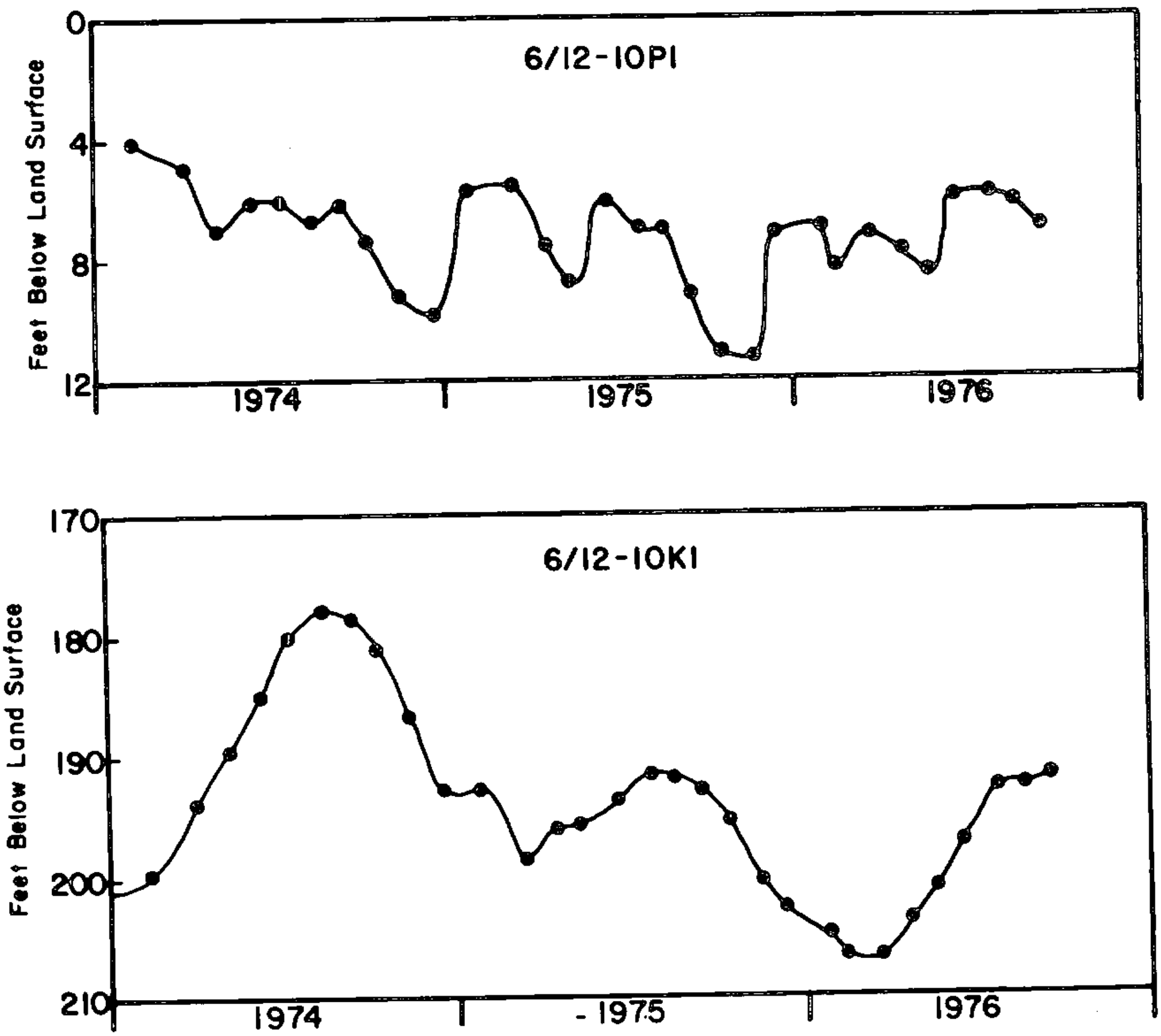

FIGURE 73. Water-level hydrographs, observation wells 6/12-10P1 and 6/12-10K1, Klickitat County, Washington.

the area and the relatively low ground-water withdrawal, it seems unlikely. Instead, the water levels may be reflecting a decrease in recharge related to a reduction in irrigation because of the wet summers of 1974 and 1975.

In general, the Camas Prairie area enjoys an abundance of ground- and surface-water supplies. In many areas, springs provide adequate domestic and stock water. Elsewhere, wells can furnish needed water supplies from either the unconsolidated deposits or the underlying basalt aquifers.

Western Highlands

Ground-water distribution and production in the western highlands is highly variable. In some areas, particularly in the northeast part of the highlands, numerous springs exist. Most of the springs have low discharges and are used primarily for stock watering. Other springs occur in the canyon areas of Major Creek and Jewett Creek and in lesser drainages. With these exceptions, springs appear to be less numerous in the highlands than in the Camas Prairie area directly to the north.

Most domestic water in the highlands is obtained from wells, although production does not appear to be as good in the highlands as elsewhere in the western part of Klickitat County. Most of the ground-water production comes from interflow zones within the Columbia River basalt; however, production is also obtained from the younger volcanics in the northeast and west. Wells in the highlands vary considerably in depth and production; however, in general, wells with depths of 200 to 300 feet, producing less than 10 gpm, are common. Reasons for the apparently restricted availability of ground water in the highlands are not evident. However, a combination of geologic structure, erosional dissection, and limited recharge are suspect.

Large-scale irrigation is virtually nonexistent in the western highlands although there has been some recent interest evident in the Laws Corner area northeast of White Salmon. To date, well production is small; however, one well, 3/11-15B1, produces 100 gpm from a depth of 185 feet. It is not known whether deep well drilling would develop large supplies in the area. Nevertheless, limitations inherent to the local dissection and limited recharge suggest that production in excess of 200 to 300 gpm would be minimal. Furthermore, declining water levels with depth, characteristic of this area, indicate that most attempts to obtain water from greater depths would result in correspondingly lower water levels.

Lower Klickitat River Valley

Geologic units in the lower Klickitat valley are restricted to basalts of the Columbia River Group and recent stream gravels deposited at wide spots in the valley. Ground-water occurrences within the valley are limited to springs issuing from joints, faults, and interflow zones within basalts and to wells drilled into the gravels or the basalts. Demand for the ground water is small, with most being for domestic purposes.

Most ground-water production is from shallow wells in the gravels or the basalts. Where sufficiently large gravel bars exist at a relatively safe elevation above the current river channel, most water is obtained from shallow dug or drilled wells in the gravels. Where the canyon is so narrow as to preclude formation of gravel bars, water is obtained from shallow wells drilled into the basalts. Because of the proximity to the river, most basalt wells are less than 100 feet deep.

Most of the large springs and deep wells exist in a unique ground-water area between Klickitat and Wahkaicus. Here, early settlers found several large springs (Klickitat Springs) with a high mineral content and charged with carbon dioxide. During the first half of this century, carbon dioxide was extracted from this water, and dry ice was manufactured. In addition, for short periods of time, the water was bottled and sold.

Several wells drilled at a later time encountered water of similar quality. Most of these wells were drilled to depths between 200 and 300 feet, and several are free-flowing. Evidence of the dry ice operations can still be seen along the highway south of Wahkaicus in what is now a fishing access area administered by Washington State. Flowing wells are still in existence here. Reasons for the unique ground-water occurrence are not fully understood, but Newcomb (1969) and Luzier (1969) have attributed it to faulting which provides a conduit for deep, warm highly mineralized waters to rise to the surface.

White Salmon River Basin

Basalts of the Columbia River Group are exposed on the sides of the White Salmon River basin and younger volcanics fill the valley bottom. The thickness of these younger volcanics is not known although it is likely that they are underlain by the older Columbia River Group and, in some areas, by older volcanics.

Like the Camas Prairie area, the White Salmon basin enjoys abundant ground-water resources. Numerous springs issue from the older basalts along the sides of the basin and from contact zones and fractures within the younger volcanics. Hydrographs of the White Salmon River indicate a gentle recession limb for the station at Underwood, which is attributed to the significant contribution of ground water in the central part of the basin. Much of this contribution is from springs around the BZ Corners area. Springs are also abundant in the Trout Lake area, and part of that community's water supply is taken from Bear Spring west of the town.

Development of ground-water resources through wells is restricted primarily to the immediate White Salmon valley, in those areas where springs or surface supplies are not available. In most cases, wells are relatively shallow, often being less than 100 feet in depth, with yields rarely exceeding 50 gpm. Wells in the valley normally tap interflow zones within the younger volcanics or in the underlying Columbia River Basalt.

In the northern part of the basin, near the town of Trout Lake, fewer wells exist because the well-established Glacier Springs water system provides domestic water to many of the houses. Information from the few wells in the area indicates a situation similar to that in the lower valley where domestic supplies are relatively easy to obtain.

One observation well (4/10-24J2) was monitored in the White Salmon valley near Husum and is probably typical. The well is 93 feet deep and terminates in an interbed within the younger volcanics. The well hydrograph, Figure 74, indicates a static level within 25 feet of the surface and relatively little annual variation. Most wells within the valley are similar, although wells drilled higher on the basin sides are likely to be somewhat deeper and may have lower water levels.

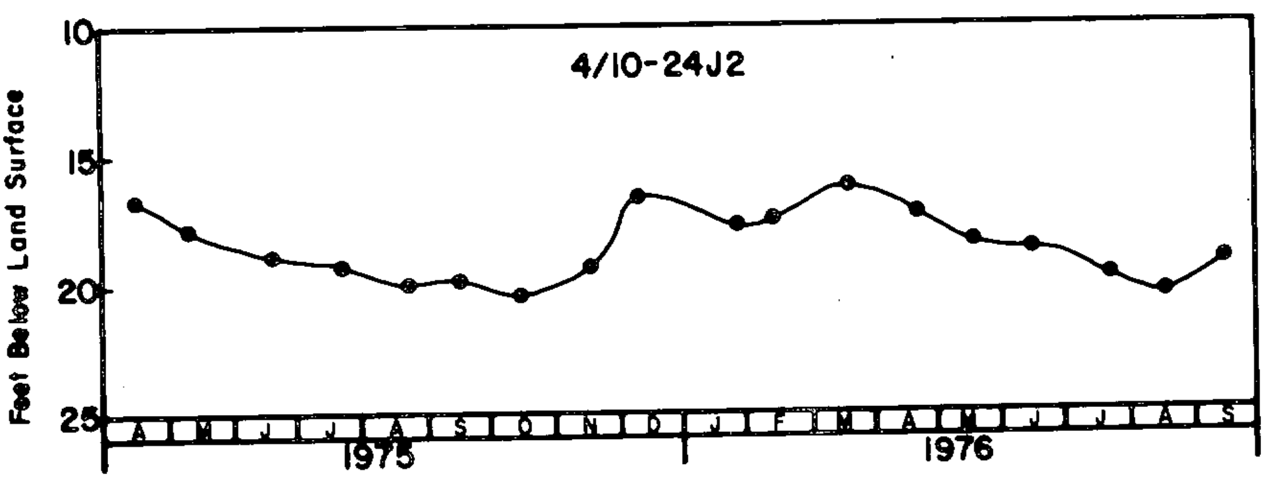

FIGURE 74. Water-level hydrograph, observation well 4/10-24J2, Klickitat County, Washington.

There is much interest in irrigation among orchardists and farmers, and it seems likely that well irrigation within the valley would be feasible. To date, no large-volume well exists, but drilling to depths in excess of 500 feet in the central valley might provide significant quantities of irrigation water.

Columbia River Gorge

The Columbia River gorge is incised into basalts of the Columbia River Group and the river flows on the basalt surface. Younger volcanics are virtually absent in the gorge except for isolated deposits related to Haystack Butte (Sec. 3, T. 2 N., R. 15 E.) which lie on the north side. In the western half of the gorge, deposits of Tertiary-Quaternary sediments, mainly tuffs and tuffaceous sands and silts, are present along the sides. These deposits tend to increase in thickness and quantity westward. Other deposits in the gorge include unconsolidated sediments, consisting mainly of glacial fluvial gravels, sands, and silts related to glacial flooding and lacustrine sediments.

Within the gorge, ground water is used primarily for domestic and municipal needs; irrigation water is generally obtained from the Columbia River. The occasional occurrences of springs in the gorge appears to be controlled predominantly by effective precipitation and geologic structure. Because of precipitation decreases in the gorge from west to east, more springs occur along the western than the eastern part of the gorge.

Although few springs with substantial discharges appear along the eastern half of the gorge, there are many small seeps and intermittent wet areas, many of which have been developed into stockwatering ponds by area ranchers. These seeps occur at interflow zones within the basalts and in fractures or joints where an avenue for ground-water discharge is available. A few springs of constant discharge occur where faults or folds have produced a ground-water conduit. An example of such a spring can be seen along Highway 14 in SE 1/4, Sec. 8, T. 3 N. R 18 E. where a spring large enough to provide domestic water occurs in a large breccia-gouge zone associated with a fault.

To the west, springs become more abundant and, as Newcomb (1969) indicated, these are controlled to some degree by the steepness of the slope. Greater numbers of springs tend to occur on the gentler slopes. Newcomb indicates that spring density in the central part of the area, northeast of Lyle, is on the order of one spring per square mile. Discharge of most of these springs is low, from 1 to 10 gpm; however, he reports isolated instances of flows on the order of 30 gpm. Springs become more common and yields greater as one moves westward toward the Bingen area.

Much of the ground water within the gorge is obtained from wells. In the eastern half of the gorge there are few wells and most are located in and around Roosevelt. Of several irrigation wells located in Sec. 21, T. 3 N., R. 20 E., most are shallow (less than 300 feet deep) and produce from 100 to 1000 gpm. Water levels in many of the wells indicate a degree of hydraulic interconnection with the nearby river, and it is likely that substantial supplies could be developed in the area.

Water supplies in the Goodnoe Hills area are generally marginal. Most wells are drilled to depths of 200-300 feet and yields are often less than 10 gpm. The probable reason for the lack of abundant ground-water supplies relates to the area's geologic and geographic position. The Goodnoe Hills area is situated on a level bench about half-way between the Columbia River and the crest of the Columbia Hills and is bisected by Rock Creek canyon. The size and location of the area suggests that it receives a limited amount of recharge and it is unlikely that large quantities of ground water will ever be obtained from wells in the Goodnoe Hills area.

Measurements from observation wells in the Goodnoe Hills area (Figure 75) indicate that although water levels are often greater than 100 feet below surface, there is little evidence of overall decline. This lack of apparent decline may be attributed to the limited production of the area and the resulting limited demand upon the area's ground-water supplies. Well 3/20-7F1 is located in Rock Creek Canyon and the water level in this well is much closer to the surface than the wells on the plateau surface. The hydrograph of this well (Figure 75) indicates good annual recovery in this area.

Near the John Day Dam an aluminum plant operated by the Martin Marietta Corporation obtains ground-water supplies from deep wells within 0.25 miles of the river. The plant requires substantial quantities of water and two of their wells (3/17-20K1 and 21C1) were drilled to 1000 or more feet. In spite of the proximity to the river, production of these wells is somewhat limited, and one (3/17-21A1) has been removed from service because of inadequate production.

In the Dallesport area, a number of wells have been drilled for irrigation and domestic supplies. Most are less than 200 feet deep and produce less than 200 gpm. Three deeper wells (2/15-22F1, 22P1, and 27B1) produce 700 to 1000 gpm.

In the Dallesport-Dalles area, a highly productive ground-water body called the Dalles Ground Water Reservoir provides the city of The Dalles with part of its municipal supply. This reservoir occupies an area of about 30 square miles which underlies The Dalles and the Columbia River. The reservoir produces abundant quantities of ground water from interflow zones about

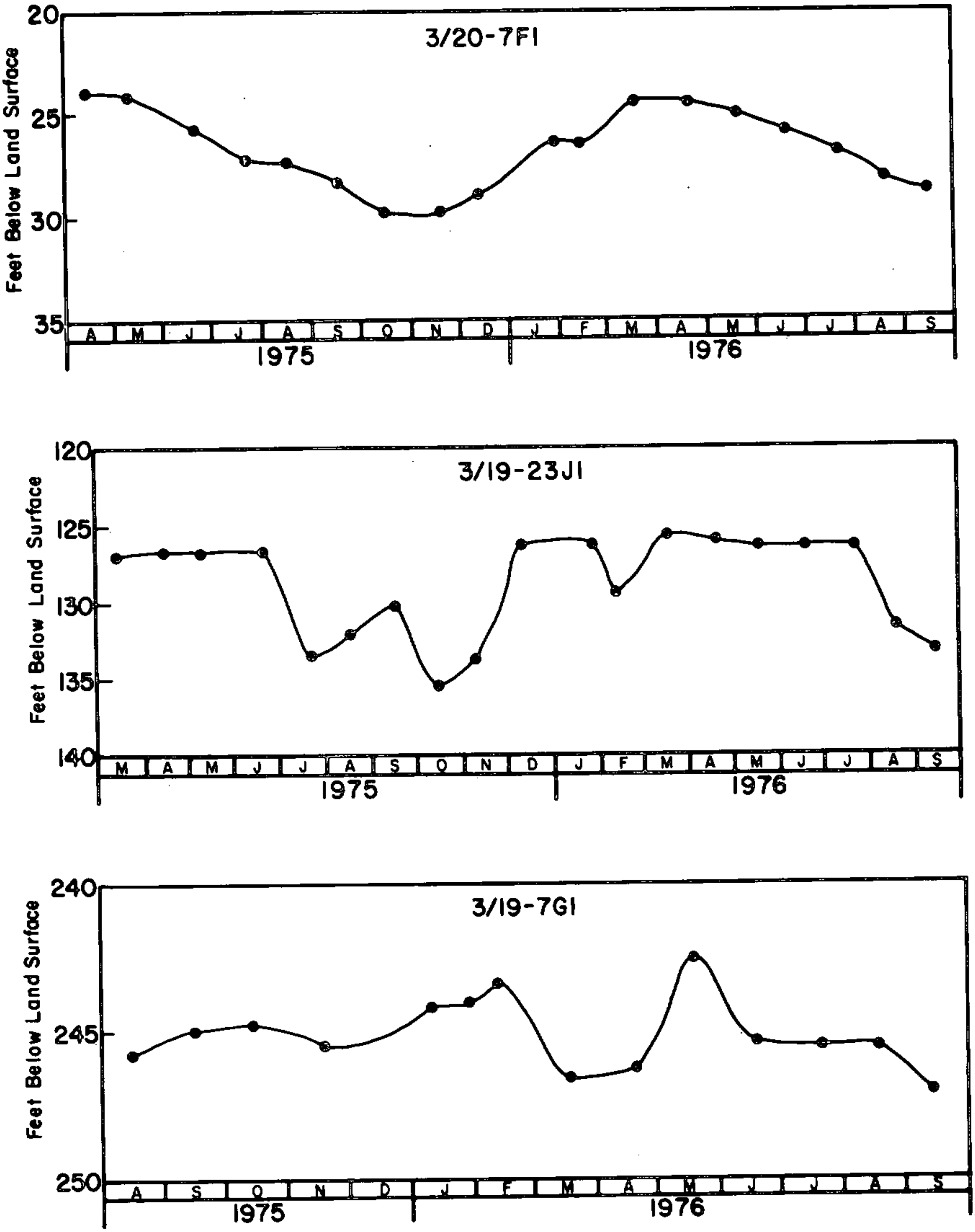

FIGURE 75. Water-level hydrographs, observation wells 3/20-7F1, 3/19-23J1, and 3/19-7G1, Klickitat County, Washington.

100 feet below sea level. Newcomb (1969) showed that wells in a part of the Dallesport area in Klickitat County also tap this ground-water body.

The Dalles Ground Water Reservoir is of considerable interest because it is an important municipal source for The Dalles and because there has been evidence of continued water-level decline in wells tapping this system. Early measurements in wells showed the water level of the reservoir to be about 77 feet above sea level (Piper, 1932). Construction of the Bonneville and later The Dalles dams raised the river level; however, in spite of the immediate proximity of the reservoir to the river, water levels of the reservoir wells did not respond. In fact, Newcomb (1969) reported a continued decline in the water-level elevation which reached 28 feet in 1964. Newcomb estimated a decline rate of about 5 feet per year for the reservoir.

Examination of water levels from The Dalles city wells and conversations with officials of the Oregon State Water Resources Division indicate that the problem of declining water levels may have changed. Water levels in several

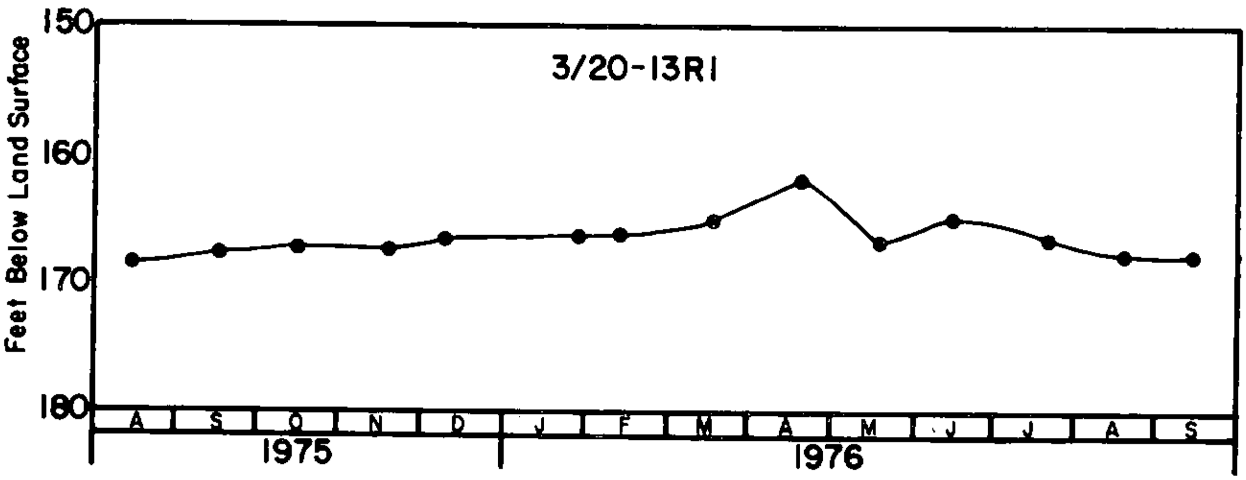

FIGURE 76. Water-level hydrograph, observation well 3/20-13R1, Klickitat County, Washington.

wells along the Columbia River now appear to be rising in response to the higher river level. In addition, water levels in The Dalles municipal wells which tap the reservoir reached elevations between 20 and 40 feet in March of 1977. This would suggest that levels have remained relatively constant since the late 1960's.

WATER QUALITY

Water quality is a function of the amount of material dissolved or suspended in the water. In general, the higher the amount of dissolved and suspended matter the poorer is the quality of the water. However, lack of certain elements, such as oxygen, can also contribute to poor water quality. Recently it has become apparent that many industrial, domestic, and recreational practices have a profound effect upon water quality. With the increased demand on water resources for agriculture, industry, and domestic uses, monitoring of water quality has become increasingly important.

To facilitate determination and maintenance of water quality, a series of water quality standards has been established. These standards are generally presented as the maximum or minimum amounts of dissolved or suspended material which will not be detrimental to public health or to the life-sustaining and aesthetic qualities of a water source.

Discussion of the water quality of Klickitat County is divided into surface-water quality, which deals primarily with the major rivers, and ground-water quality which includes springs and wells. Surface-water quality data is a compilation of analyses done by the U. S. Geological Survey. Ground-water quality information was assembled from previous studies of selected areas within the county. No original water quality analyses were made in this study.

Surface-Water Quality

Much of the county is semiarid and lakes are virtually nonexistent. Thus, information on surface-water quality in Klickitat County is restricted largely to perennial rivers and streams. A compilation of the availability of surface-water quality data is presented in Table 5. Locations of the sampled sites, presented in Table 5, are shown on Plates I, II, and III. It can be seen that little long-term water quality information exists. The most continuous chemical analyses available are for the Klickitat River near Pitt and the White Salmon River near Underwood. Selected parts of these analytical data are presented in Appendix F. The complete analyses are available in the yearly water quality summaries published by the U. S. Geological Survey and in Van Winkle (1914) and Santos (1965). In addition, partial listings of chemical analyses from streams in the Glenwood-Camas Prairie area and from the Little Klickitat River near Wahkaicus are presented in Santos (1965). Analyses for the remaining stations in the Glenwood area are available in the 1974 edition of Water Resources Data for Washington, Vol. 2, Water Quality Records.

Specific Properties and Constituents

Records indicate that the number and type of water quality properties and constituents tested have varied considerably with time and sampling site. Therefore, only the few properties and constituents which are repeated frequently and which are good indicators of stream quality were chosen for presentation and discussion. These properties and constituents are temperature, conductivity, pH, dissolved oxygen, dissolved solids, total nitrate, and total coliform. A discussion of each is presented below.

Temperature

Water temperature, when combined with other properties and constituents, provides an indication of water quality. Warmer water tends to increase the rate of biological reactions and results in excessive oxygen depletion. Loss

TABLE 5: Availability of surface-water quality data, Klickitat County and upper Klickitat River basin, Washington.

Gaging Station	U.S.G.S Number	Daily Temperature	Daily Suspended Sediment	Periodic Chemical Analyses
Alder Creek at Alderdale	14034350	1962-1966	1962-1968	
Rock Creek near Roosevelt	14036000	1962-1968	1962-1968	
Klickitat river below Soda Springs Creek	14108200			1974
Big Muddy Creek	14109000			1974
Klickitat River near Glenwood	14110000	1950-1956, 1970		1959
Trout Creek	14110480			1974
Elk Creek	14110490			1974
Outlet Creek above Outlet Falls	14110720			1974
White Creek	14110800			1974
Summit Creek	14111100			1974
Klickitat River near Dead Canyon	14111500			1974
Little Klickitat River near Wahkaicus	14112500			1959
Klickitat River near Pitt	14113000	1950-1970		1910-1911, 1959, 1966-1975
White Salmon near Underwood	14123500	1968-1970		1960-1973

of oxygen can cause an overall decrease in water quality. In addition, the ability of water to dissolve material is temperature-dependent, and a warm stream normally will contain a higher concentration of dissolved solids.

Conductivity

Conductivity is the ability of water to conduct electricity. Since conductivity is directly related to the amount of dissolved material present in the water, it can be used as an indicator of dissolved solids and water hardness; high conductivity values indicate a high content of dissolved material.

pH

pH is a measurement of the acidity or alkalinity of water and is based on a numerical scale of 1 to 14, 7 being neutral. In general, stream pH is nearly neutral; slight acidity or alkalinity is indicative of concentrations of dissolved material in the water.

Dissolved Oxygen

The amount of dissolved oxygen in the water is important because aerobic decomposition is oxygen-dependent. If oxygen is not present in sufficient quantity to support aerobic decomposition, anaerobic decomposition takes place and often produces undesirable end products. In addition, maintenance of normal populations of fish and other aquatic organisms is dependent upon adequate quantities of dissolved oxygen.

Dissolved Solids

Normally, water hardness is a direct function of the amount of dissolved solids present in the water. While hardness is not often a health hazard, very hard water is not desirable for domestic use because of taste and residue problems.

Total Nitrate

Because nitrates are an end product of the normal decomposition of organic nitrogen compounds, measurement of nitrate levels in a given water source has been successfully used to determine at what time pollution of the water occurred. Knowledge of nitrate content is especially important in light of recent evidence that high nitrate levels pose a definite health hazard. This is particularly important in agricultural areas where nitrogen fertilizers are used extensively.

Total Coliform

Fecal coliform bacteria are a definite health hazard. Likely sources for coliform bacteria in rivers and streams are sewer treatment plant effluent, septic tank discharge, and grazing stock.

Examination of tables in Appendix F indicates that overall quality of surface water in the county is good. The water quality analyses reflect the geography of the stream basins. All principal streams within the county have a steep gradient which ensures good oxygenation and tends to prevent development of high water temperatures. In addition, the limited population and lack of related industry reduces the amount of potential pollutants.

Records from the White Salmon and Klickitat Rivers (Appendix F) show that the rivers have maintained consistently good quality through the period of analysis. Comparisons of analyses for the Klickitat River between 1910 and recent years demonstrate little variation in dissolved solids and total nitrates. A new sewage treatment facility at the town of Klickitat is reflected in the total coliform record of the station at Pitt. Prior to 1973 (the year in which the new facility came into service) the median value of total coliform was 556 mg/1, in contrast to 341 mg/1 after 1973.

Water Quality

Like the Klickitat River, the White Salmon River is relatively low in pollutants, with the possible exception of total coliform. The moderately high coliform count in the river is probably related to the presence of numerous homesites and their related septic systems along parts of the river and, to a lesser extent, to grazing along the river and some of its tributaries.

Classification of Washington Rivers and Streams

In 1970, regulations were initiated by the Water Pollution Control Commission of Washington setting water quality standards for intrastate rivers and streams and classifying the streams relative to these standards. The regulations established four classes of streams based on seven water quality criteria. The seven criteria are total coliform content, dissolved oxygen content, temperature, pH, turbidity, toxic, radioactive and deleterious material concentrations, and aesthetic value. The classes established are: AA-extraordinary, A-excellent, B-good, and C-fair.

In addition to the development of quality standards, the regulations assigned many of the rivers and streams in the state to one of the above classes, based on the stream's water quality. Both the Klickitat and White Salmon Rivers are classified A relative to the seven criteria listed above. Comparisons of Appendix F with the criteria established for each class reveals that for those criteria presented in the tables (total coliform, dissolved oxygen, temperature, and pH), the only criteria which necessitated classification of the two rivers as class A rather than AA was total coliform content. For both streams, total coliform median values exceeded the class AA limit of 50 and approached the class A limit of 240. This comparison suggests that both the White Salmon and Klickitat rivers are of relatively high quality and it is likely that the standards for these two rivers are representative for most of the perennial streams in Klickitat County.

Ground-Water Quality

Availability of information on ground-water quality within the study area is limited. Most of the data available are from the central part of the county and were collected by Luzier (1969) from the Goldendale-Centerville area. Some ground-water quality data are also available for the Camas Prairie area from work by Cline (1976).

As in surface-water quality studies, selected properties and constituents of ground water are tested to determine overall quality. In general, the water is tested for selected anions and cations dissolved in the water. Generally, the particular ions chosen are those which make up the bulk of the dissolved material in the water and thus are the principal determinants of water quality. A compilation of water analyses from wells and springs in Klickitat County is presented in Tables G-1 and G-2, Appendix G. As can be seen in the tables, the principal ions chosen for analyses are silica, chloride, calcium, iron, magnesium, sodium, potassium, bicarbonate, carbonate, fluoride, nitrate and orthophosphate. In addition to these ions, conductivity, pH and total hardness were determined, as these parameters often give a general assessment of water quality. Of the constituents tested, iron, calcium, magnesium, bicarbonate, carbonate, sulfate and chloride are perhaps the most important for ground waters of Klickitat County.

In 1962, the U. S. Public Health Service established general drinking water standards for the United States. Table 6 presents these standards to provide a comparison with the water quality analyses presented in Appendix G.

TABLE 6. Maximum allowable concentration of selected constituents for public water supplies.

Substance	Concentration mg/l
Arsenic (As)	0.01
Barium (Ba)	1.0
Boron (B)	1.0
Cadmium (Cd)	0.01
Carbon Chloroform Extract (CCE)	0.2
Chloride (Cl)	250.0
Chromium (hexavalent, Cr^{+6})	0.05
Copper (Cu)	1.0
Cyanide (CN)	0.01
Fluoride (F)	2.0
Iron (Fe)	0.3
Lead (Pb)	0.05
Mercury (Hg)	0.005
Manganese (Mn)	0.05
Nitrogen (n) (nitrate plus nitrite)	10.0
Selenium (Se)	0.01
Silver (Ag)	0.05
Sulfate (SO_4)	250.0
Total Dissolved Solids (TDS)	500.0
Zinc (Zn)	5.0

Many of these standards were incorporated into the Washington State Rules and Regulations regarding public water supplies and are thus the minimum standards for quality of public water supplies within the state.

Specific Properties and Constituents

Iron

The presence of levels of dissolved iron in water in excess of 0.3 mg/l is generally considered undesirable because of taste, staining, and residue problems. Most wells and springs sampled within the county have iron levels well below the 0.3 mg/l limit. In most cases, those ground-water sources with high iron levels were in the unconsolidated sediments of the Swale Creek valley and the Camas Prairie area where higher iron values are more likely to occur. Some wells penetrating basalt aquifers also exhibit high iron content, however. The recently drilled City of Goldendale well (4/16-16Q2) had one analysis of 0.26 mg/1 iron, which approaches the recommended limit. A second analysis of the well, however, gave a much lower iron value, which suggested the iron content may not be as high as originally indicated.

Although no analyses were available, visual inspection of water supply facilities in the White Salmon River drainage, near Husum, indicates the possibility of high iron concentrations in ground water. Several domestic residences have experienced severe iron staining and incrustation problems. Most of the wells in the area are drilled into younger volcanics in the river valley with aquifers often located in the sedimentary interbeds. The source of the iron is not known but may be derived from the younger volcanic flows. Because of the majority of potable water wells tap basalt aquifers, iron does not appear to be a serious problem in most areas of the county.

Calcium and Magnesium

Calcium and magnesium make up a substantial part of all dissolved cations in most of the ground waters sampled. It is principally calcium and magnesium which combine with soap to form the relatively insoluble precipitates commonly associated with hard water. Newcomb (1972) found that in the aquifers of the Columbia River Basalt Group, calcium and magnesium ranged from 20 to 100 mg/1. As can be seen from Appendix G, most of the values for ground-water sources within the county fall within this range.

Newcomb suggests that much of the calcium present in ground-water supplies is obtained from percolation through the soil and superficial weathering zone of the basalts. This would seem likely, as those wells which fail to penetrate the basalts have much the same calcium content as those which tap basalt aquifers. Newcomb also noted an increase in these cations in areas where there was substantial irrigation return flow. It is possible that in areas of heavy irrigation within the county some concentration of these cations in the ground-water supply may be noted.

Bicarbonate

Like the cations magnesium and calcium, bicarbonate is a principal anion in normal ground waters of the Columbia River Basalt Group. Newcomb (1972) lists bicarbonate values ranging from 50 to 300 mg/1 and most of the sources sampled within Klickitat County are well within that range. Within the county, most samples show bicarbonate values between 30 and 150 mg/1.

Hardness

A combination of several of the above constituents contributes to a water characteristic referred to as hardness. Hardness is generally calculated in mg/1 of $CaCO_3$ because it is normally the calcium and, to a lesser extent, the magnesium cations, and the carbonate and bicarbonate anions which are the significant determinants of hardness. Tables G-1 and G-2, Appendix G, present hardness values for wells and springs in Klickitat County.

The relatve hardness scale commonly used is presented by Brown and others (1970) and is as follows: 0-60 mg/1, soft; 61-120 mg/1, moderately hard; 121-180 mg/1, hard; and greater than 180 mg/1, very hard. Based on this scale, most of the county's ground-water sources are in the moderately hard to hard range although a substantial number (12 of 86) of the wells sampled showed very hard conditions. The reason for these hard water wells is not readily apparent but may relate to irrigation of sedimentary deposits in the Swale Creek area. This seems to be substantiated by Vandenburg and Santos

(1965), who documented a relationship between well depth and hardness for wells in their Columbia Plateau Province. They found that a decrease in hardness occurred with depth and attributed it to the fact that small amounts of calcium and magnesium surface sediments must be concentrated in irrigation return waters.

Unique Occurrences

Within Klickitat County there are several occurrences of ground water of very anomalous quality. The best known of these occurrences is along the Klickitat River between the towns of Klickitat and Wahkaicus. Here, an occurrence of soda springs led to the drilling of many wells, several of which flow. The water from both the springs and wells was found to be charged with carbon dioxide and an extraction plant was constructed to extract the CO_2 for dry ice. Analyses from two of the wells in the immediate area (4/13-24H1 and 4/14-19C1) are presented in Table G-1, Appendix G. Examination of these analyses reveals the waters to have a very high dissolved solids content. Silica, calcium, magnesium, iron, sodium and potassium are much higher than in most other wells in the county. Newcomb (1972) suggests that these levels are much higher than most ground-water sources of the Columbia Plateau.

Springs with water of similar unique chemical composition have been noted by Cline (1976); the analyses are presented in Table G-2, Appendix G. The presence of these highly unusual ground-water sources is not fully understood. The proximity of these waters to the younger volcanics has led most researchers to propose a relatively warm, deep-seated source with migration of the surface being facilitated by near-vertical fault zones.

Water Quality

Summary

Water quality information indicates that, in general, Klickitat County enjoys ground water of good quality. Analyses of water from basalt wells indicate that although the water is moderately hard, it contains relatively minor amounts of other dissolved solids and lacks traces of toxic chemicals. Waters obtained from wells and springs in the sediments are generally of poorer quality than those from underlying basalt aquifers but in most cases are still quite usable. The sedimentary aquifers have slightly higher calcium, magnesium and bicarbonate contents which result in slightly higher hardness; some contain high concentrations of iron. Ground-water sources from the younger volcanics are of varying quality with some wells in the White Salmon River Valley also having high iron concentrations.

WATER USE

Introduction

Much of the Klickitat County is semiarid with little appreciable precipitation occurring during the summer crop-growing months. As a result, surface- and ground-water resources have been important since the area was first settled. In the early days, the perennial streams in the central and western parts of the county were immediately recognized as sources of irrigation and stockwater and many were heavily appropriated. Later, availability of ground-water supplies led to increased development of well irrigation in the central and eastern parts of the county. Currently, much of the county's surface-water resources are fully appropriated and the demand for ground water is continuing to increase.

Water-Right Law

Although the water resources of the State of Washington are a public trust, the right of private individuals to use these resources was established in Article XXI of the State Constitution. The procedure for securing such a right was established in Chapter CXLII, Session Laws of 1891. Most of the early water appropriations involved surface waters, but a growing population and limited surface-water resources soon resulted in problems. As a result of these problems a Surface Water Code was established in Chapter 117, Laws of 1917. Unlike anything prior to this time, the laws established an office of Hydraulic Engineer (now incorporated in the Department of Ecology) and established a formal water-right application procedure which included review by the Hydraulic Engineer and an opportunity for formal protest by all concerned parties. The Surface Water Code, as established in 1917, is essentially the same as that in operation today.

Concern over rights to ground water within the state did not become manifest until the 1940's. In response to this concern, the legislature passed the Washington State Ground Water Code to establish procedures for securing a right to ground-water withdrawal. The procedure established is much the same as that set forth in the Surface Water Code. Applicants must apply for a permit and, if granted, they may begin improvements and subsequently make withdrawals. Once the well or works have been constructed and the water is put to beneficial use, certification is effected and the actual water right is secured. Ground-water withdrawals of less than 5,000 gallons per day are exempt from the above procedure.

In 1967, the Washington State Legislature passed the Water Rights Claim Registration Act in an attempt to obtain a more complete inventory of water use within the state. The act specified a five-year period from 1969 to 1974 during wich claims were to be filed. Everyone who claimed a right to the use of surface or ground waters within the state was required to file a water right claim. Those holding water rights issued by the state were exempted from this program.

Water Rights in Klickitat County

Examination of water-right records of the Department of Ecology reveals a total of 1015 water-right claims in Klickitat County. Of these, 401 are for ground water, 594 are for surface water, and 20 are for reservoir water, principally from the Columbia River. For management purposes, the Department of Ecology considers springs as surface-water sources, and they are so included in this report. The 401 ground-water claims are for a total of 157, 913.5 gpm and the 594 surface claims for a total of 568.55 cfs. Principal use of the water resources of the county is irrigation.

The claims are in all stages, from application through certification, and no attempt has been made to distinguish them further. Appendix H contains a list of all surface-water and ground-water claims as of June 30, 1976. Those that have been certificated are so indicated. Tables 7 through 12 and 16 through 24 present a breakdown of periodic claim totals by individual drainage basin and a distribution of the claim with respect to both time and geophysical area. The tables present both the instantaneous appropriation in cfs (gpm for ground water) and annual appropriation in acre-feet. In many instances, the instantaneous amount is specified but the annual appropriation is not. Lack of both an instantaneous and annual figure for every claim accounts for the differences in amount apparent between the two columns in each of the tables. The tables do provide a good indication of water-resource development within the county over the last 25 years.

Analysis of Individual Drainage Basins

White Salmon River Basin

Table 7 reveals that surface-water fillings within the White Salmon River basin have changed gradually since 1950. Between 1950 and 1955 the total number of claims almost doubled and then changed little until after 1970. The change of 28.34 cfs between 1970 and 1976 is quite likely because of the Water Right Claim Registration Act and the effort from 1969 and 1974 to encourage filing of water-right claims. The total amount surface water claimed (116.12 cfs) is substantially less than the low flow of the White

Salmon River at Underwood (see Table 4), which suggests that some water may still be available for appropriation. However, existing rights, hydroelectric power requirements, and fish and wildlife requirements must all be taken into consideration.

Ground-water claims within the basin, though insignificant in comparison to surface-water claims, have increased substantially in the last ten years. Part of this increase is undoubtedly in response to the registration act, but may be partly attributed to recent interest in irrigating higher plateau areas where adequate surface-water supplies do not exist.

Major-Creek Basin

The small size and steep topography of the Major Creek basin has understandably limited the amount of surface-water claims (Table 8). A total of 1.61 cfs has been requested, most of which is for domestic and stockwater uses and is obtained from small springs within the basin.

Ground-water claims in the area are also small but approach in total quantity that of the much larger White Salmon River basin. Most of the ground-water fillings were made between 1970 and 1975 and are likely in response to the registration act.

Klickitat River Basin

The Klickitat River basin is the largest drainage basin in the county and includes the subsidiary drainage basins of the Little Klickitat River and Swale Creek. The amount of surface water claimed within the Klickitat River basin totaled 437.25 cfs as of 1976 (Tables 10, 11, and 12). Of this total, 87% or 378.34 cfs is claimed within the main Klickitat River basin exclusive of the Little Klickitat and Swale Creek basins. Most of these surface-water claims within the Klickitat River basin are in the Camas Prairie area and

and in the western part of the basin. Comparison of total number of cfs claimed in 1950 and in 1976 (Table 10) reveals little increase in appropriation over the 26 year period. This is not particularly surprising as many of the claims date back to the late 1800's and are some of the earliest surface-water claims in the county. Most claims are for domestic and stock use and for irrigation of Camas Prairie.

As in the western part of the Klickitat River basin, there has been relatively little change in surface-water claims in the Little Klickitat River basin since 1950. The surface-water resources available in the Little Klickitat basin are substantially less than in other parts of the Klickitat basin and most of the resources were appropriated in the late 1800's.

Ground-water claims within the Klickitat River basin are almost exclusively restricted to the Little Klickitat and Swale Creek basins. Only 2044 gpm or 3% of the total amount claimed for the entire Klickitat River basin are from locations outside the Little Klickitat and Swale Creek basins. Tables 11 and 12 reveal a substantial increase in listings between 1970 and 1975 for both basins. A part of the increase between 1970 and 1975 is probably attributable to the registration act; however, analysis of irrigation power requirements presented in Table 13 indicates a steady increase in both customers and total kilowatt-hours (KWH) per year. This suggests that a substantial part of the increase does indeed indicate an increase in ground-water withdrawal.

An attempt was made to determine what effect, if any, the increased withdrawal in the Little Klickitat and Swale Creek basins had upon the streams in the area, particularly the Little Klickitat River. The analysis involved comparisons of stream discharge records between the gaging station at Goldendale, which is located above most of the ground-water withdrawals in the basin, and the station at Wahkaicus where the Little Klickitat River enters the Klickitat River. A simple ratio was calculated between monthly mean discharges at each station for the six-month period of May through October and for the three-month low-flow period of July, August and September. The analysis was complicated by several factors including: 1) unregulated discharge of the Goldendale sewer plant into the Little Klickitat River; 2) unknown withdrawals directly from the stream; 3) lack of adequate gaging station records.

Tables 14 and 15 contain the results of the analysis. Little consistent change in the ratio is apparent through the period of increased pumping, which would suggest the increased withdrawal of ground water has little effect upon the flow of the Little Klickitat River. Considering the general nature of the method and the numerous variables involved, more detailed modeling efforts using improved withdrawal figures are needed.

Alder Creek and Dead Canyon Basins

The Alder Creek and Dead Canyon-Glade Creek basins occupy a substantial part of the eastern third of the county. There is virtually no surface water in the area, and accordingly there are no claims for surface-water rights. Substantial deep-well irrigation is being developed, and Tables 17 and 18 reflect this. Prior to 1950, no ground-water rights were recorded in these areas, while the combined areas now account for 54,290 gpm or 34% of the total ground-water claims in the county. While a part of this total is probably related to the registration act, the change in amount in the Alder Creek basin (Table 17) between 1975 and 1976 reflects the continuing interest in deep-well irrigation potential of these areas.

Other Basins

Tables 19 through 24 contain water-right listings for several of the smaller basins in the eastern half of Klickitat County. Included in these tables are Rock Creek, Wood Gulch, Chapman Creek, Old Lady Canyon, and Pine Creek basins. These basins lie in the drier eastern part of the county and include large areas not suited for irrigation. The lack of surface water, particularly during the summer months, limits most of the surface-water right listings to springs used for domestic or stockwater purposes. Some of the basins have no surface-water listings whatsoever.

Most basins have a few ground-water listings; the total of all five basins amounts to 15,834 gpm. Many of these rights are for domestic and stock uses.

TABLE 7. Summation of surface- and ground-water appropriation, White Salmon River basin, Klickitat County, Washington.

Year	Surface Water		Ground Water	
	cfs	acre-feet	gpm	acre-feet
1950	43.60	0.12	67.0	38.0
1955	74.80	187.13	67.0	38.0
1960	79.20	1411.63	117.0	66.0
1965	80.05	1594.63	217.0	91.6
1970	87.78	3022.92	894.0	322.1
1975	116.12	5824.72	1368.0	473.9
1976	116.12	5824.72	1393.0	473.9

TABLE 8. Summation of surface- and ground-water appropriation, Major Creek basin, Klickitat County, Washington.

Year	Surface Water cfs	Surface Water acre-feet	Ground Water gpm	Ground Water acre-feet
1950	--	--	--	--
1955	0.01	--	--	--
1960	0.24	--	--	--
1965	0.80	128.5	--	--
1970	0.90	128.5	47.0	25.0
1975	1.61	156.5	1283.5	53.0
1976	1.61	156.5	1283.5	53.0

TABLE 9. Summation of surface- and ground-water appropriation, Water Resource Inventory Area 29 exclusive of the White Salmon River basin, Klickitat County, Washington.

Year	Surface Water cfs	Surface Water acre-feet	Ground Water gpm	Ground Water acre-feet
1950	0.25	--	--	--
1955	0.25	--	500.0	800.0
1960	0.85	120.0	500.0	800.0
1965	2.90	1019.0	560.0	831.2
1970	2.96	1031.0	1870.0	1705.2
1975	4.69	1356.3	2696.5	2289.7
1976	5.19	1356.3	2696.5	2289.7

TABLE 10. Summation of surface- and ground-water appropriation, Klickitat River basin exclusive of Little Klickitat River and Swale Creek basins, Klickitat County, Washington.

Year	Surface Water		Ground Water	
	cfs	acre-feet	gpm	acre-feet
1950	341.20	1.0	--	--
1955	353.24	2.75	390.0	287.0
1960	353.55	45.75	410.0	296.6
1965	355.75	488.75	430.0	298.6
1970	360.22	1326.35	589.0	430.6
1975	378.34	2817.69	1009.0	532.6
1976	378.34	2817.69	2044.0	532.6

TABLE 11. Summation of surface- and ground-water appropriation, Little Klickitat River basin, Klickitat County, Washington.

Year	Surface Water		Ground Water	
	cfs	acre-feet	gpm	acre-feet
1950	38.23	1987.33	413.0	100.94
1955	38.80	2116.37	831.0	281.34
1960	39.92	2156.37	1374.0	532.54
1965	43.46	3020.47	3053.0	1596.68
1970	45.75	3178.67	26,838.0	12,243.1
1975	54.52	3465.47	47,304.0	21,486.1
1976	58.54	3465.47	47,464.0	21,486.1

TABLE 12. Summation of surface- and ground-water appropriation, Swale Creek basin, Klickitat County, Washington.

Year	Surface Water cfs	Surface Water acre-feet	Ground Water gpm	Ground Water acre-feet
1950	--	--	125.0	40.0
1955	--	--	125.0	40.0
1960	--	--	200.0	100.0
1965	--	--	465.0	296.0
1970	--	--	10,905.0	6124.1
1975	0.37	56.4	19,533.5	10,202.0
1976	0.37	56.4	19,533.5	10,202.2

TABLE 13. Electrical power usage for irrigation customers, Goldendale substation, Klickitat County, Washington.

Year	Number of Customers	KWH/yr/customer	Total KWH/yr
1960	--	--	1,925,896
1961	--	--	2,027,629
1962	--	--	2,474,585
1963	--	--	2,667,462
1964	70	40,305	2,821,350
1965	70	47,254	3,307,780
1966	80	49,176	3,934,080
1967	92	36,401	3,348,982
1968	107	50,184	5,369,688
1969	139	45,128	6,272,792
1970	154	48,749	7,507,346
1971	158	52,119	8,234,802
1972	166	48,131	7,989,746
1973	172	58,420	10,048,240
1974	186	57,385	10,673,610
1975	195	55,377	10,798,515
1976	204	61,933	12,634,322

TABLE 14. Comparison of monthly mean discharge (July-September) between stream gaging stations near Goldendale and Wahkaicus on the Little Klickitat River, Klickitat County, Washington.

Date		Monthly Mean Discharge (cfs)			
Year	Month	Goldendale (A)	Wahkaicus (B)	Ratio A/B	Average Ratio
1947	July	2.91	24.3	0.120	
	Aug.	1.09	19.9	0.055	
	Sept.	2.01	23.3	0.086	0.087
1948	July	11.2	49.3	0.227	
	Aug.	4.32	33.1	0.131	
	Sept.	3.18	29.4	0.108	0.155
1949	July	9.19	45.0	0.204	
	Aug.	3.38	35.0	0.097	
	Sept.	3.14	36.0	0.087	0.129
1950	July	18.9	66.0	0.286	
	Aug.	5.3	37.0	0.143	
	Sept.	3.7	31.0	0.119	0.183
1951	July	12.8	59.3	0.216	
	Aug.	4.35	42.3	0.103	
	Sept.	4.17	42.4	0.098	0.139
1958	July	6.65	36.1	0.184	
	Aug.	1.99	24.9	0.080	
	Sept.	2.65	31.6	0.084	0.116
1959	Aug.	1.30	20.8	0.065	
	Sept.	2.84	29.3	0.097	0.108
1960	July	4.83	24.6	0.196	
	Aug.	1.60	19.1	0.084	
	Sept.	1.29	24.2	0.053	0.111
1961	July	8.57	41.3	0.208	
	Aug.	3.13	29.7	0.105	
	Sept.	2.70	28.7	0.112	0.142
1963	July	5.17	35.3	0.147	
	Aug.	1.58	22.9	0.067	
	Sept.	1.21	23.9	0.051	0.087
1964	July	7.50	30.0	0.250	
	Aug.	2.71	21.0	0.129	
	Sept.	2.07	22.1	0.094	0.158

TABLE 14 (Cont'd)

Date		Monthly Mean Discharge (cfs)			
Year	Month	Goldendale (A)	Wahkaicus (B)	Ratio A/B	Average Ratio
1965	July	4.95	30.9	0.160	
	Aug.	2.67	25.0	0.107	
	Sept.	2.55	26.9	0.095	0.121
1966	July	11.9	39.3	0.303	
	Aug.	2.64	19.7	0.134	
	Sept.	2.36	24.2	0.098	0.178
1967	July	3.27	20.3	0.161	
	Aug.	0.63	12.5	0.050	
	Sept.	0.77	17.4	0.044	0.085
1968	July	1.59	15.8	0.101	
	Aug.	2.19	18.5	0.118	
	Sept.	2.88	25.6	0.113	0.111
1969	July	5.76	30.7	0.188	
	Aug.	1.71	20.6	0.083	
	Sept.	2.65	26.7	0.99	0.123
1970	July	4.44	25.9	0.171	
	Aug.	1.11	16.7	0.067	
	Sept.	1.14	18.2	0.063	0.100

TABLE 15. Comparison of monthly mean discharge (May-October) between stream gaging stations near Goldendale and Wahkaicus on the Little Klickitat River, Klickitat County, Washington.

Date		Monthly Mean Discharge (cfs)			
Year	Month	Goldendale (A)	Wahkaicus (B)	Ratio A/B	Average Ratio
1947	May	34.1	97.3	0.350	
	June	13.6	55.4	0.246	
	July	2.91	24.3	0.120	
	Aug.	1.09	19.9	0.055	
	Sept.	2.01	23.3	0.086	
	Oct.	19.1	54.6	0.350	0.201
1948	May	102.0	242.0	0.422	
	June	51.3	146.0	0.351	
	July	11.2	49.3	0.227	
	Aug.	4.32	33.1	0.131	
	Sept.	3.18	29.4	0.108	
	Oct.	5.08	35.0	0.145	0.231
1949	May	118.0	320.0	0.369	
	June	39.0	120.0	0.325	
	July	9.19	45.0	0.204	
	Aug.	3.38	35.0	0.097	
	Sept.	3.14	36.0	0.087	
	Oct.	4.89	32.0	0.153	
1950	May	88.4	280.0	0.316	
	June	67.0	170.0	0.394	
	July	8.9	66.0	0.286	
	Aug.	5.3	37.0	0.143	
	Sept.	3.7	31.0	0.119	
	Oct.	14.3	54.3	0.263	0.254
1951	May	107.0	297.0	0.360	
	June	44.9	125.0	0.359	
	July	12.8	59.3	0.216	
	Aug.	4.35	42.3	0.103	
	Sept.	4.17	42.4	0.098	0.227
	Oct.	--	--	--	
1958	May	83.6	194.0	0.431	
	June	24.5	77.6	0.316	
	July	6.65	36.1	0.184	
	Aug.	1.99	24.9	0.080	
	Sept.	2.65	31.6	0.084	
	Oct.	3.89	35.6	0.109	0.201

TABLE 15 (Cont'd)

Date		Monthly Mean Discharge (cfs)			
Year	Month	Goldendale (A)	Wahkaicus (B)	Ratio A/B	Average Ratio
1959	May	37.5	96.6	0.388	
	June	18.4	51.2	0.359	
	July	4.16	25.8	0.161	
	Aug.	1.36	20.8	0.065	
	Sept.	2.84	29.3	0.097	
	Oct.	4.4	38.0	0.116	0.198
1960	May	62.3	161.0	0.387	
	June	28.6	74.4	0.384	
	July	4.83	24.6	0.196	
	Aug.	1.6	19.1	0.084	
	Sept.	1.29	24.2	0.053	
	Oct.	2.75	30.8	0.089	0.199
1961	May	69.7	179.0	0.389	
	June	40.0	98.7	0.427	
	July	8.57	41.3	0.208	
	Aug.	3.13	29.7	0.105	
	Sept.	2.7	28.7	0.094	
	Oct.	5.48	37.7	0.145	0.228
1962	May	60.4	152.0	0.397	
	June	30.4	72.4	0.420	
	July	7.16	33.6	0.213	
	Aug.	3.11	27.8	0.112	
	Sept.	2.4	26.8	0.090	
	Oct.	8.83	45.7	0.193	0.238
1963	May	56.7	152.0	0.373	
	June	17.7	62.3	0.284	
	July	5.17	35.3	0.147	
	Aug.	1.58	22.9	0.069	
	Sept.	1.21	23.9	0.051	0.171
	Oct.	2.92	30.4	0.096	
1964	May	50.8	110.0	0.462	
	June	36.9	82.8	0.448	
	July	7.5	30.0	0.250	
	Aug.	2.71	21.0	0.129	
	Sept.	2.07	22.1	0.094	
	Oct.	3.6	32.5	0.111	0.250

TABLE 15 (Cont'd)

Date		Monthly Mean Discharge (cfs)			
Year	Month	Goldendale (A)	Wahkaicus (B)	Ratio A/B	Average Ratio
1965	May	50.1	130.0	0.385	
	June	23.4	70.0	0.334	
	July	4.95	30.9	0.160	
	Aug.	2.67	25.0	0.107	
	Sept.	2.55	26.9	0.095	
	Oct.	4.3	32.2	0.134	0.203
1966	May	64.6	151.0	0.428	
	June	26.8	62.4	0.430	
	July	11.9	39.3	0.303	
	Aug.	2.64	19.7	0.134	
	Sept.	2.36	34.2	0.098	
	Oct.	4.02	32.2	0.125	0.253
1967	May	51.7	109.0	0.474	
	June	24.4	59.7	0.409	
	July	3.27	20.3	0.161	
	Aug.	0.63	12.5	0.050	
	Sept.	0.77	17.4	0.044	
	Oct.	6.15	32.3	0.190	0.222
1968	May	16.0	52.2	0.307	
	June	6.27	33.6	0.187	
	July	1.59	15.8	0.101	
	Aug.	2.19	18.5	0.118	
	Sept.	2.88	25.6	0.113	
	Oct.	6.17	33.1	0.186	0.169
1969	May	89.6	212.0	0.423	
	June	30.2	94.3	0.320	
	July	5.76	30.7	0.188	
	Aug.	1.71	20.6	0.083	
	Sept.	2.65	26.7	0.099	
	Oct.	5.27	37.8	0.139	0.209
1970	May	53.9	115.0	0.469	
	June	28.7	60.4	0.475	
	July	4.44	25.9	0.171	
	Aug.	1.11	16.7	0.067	
	Sept.	1.14	18.2	0.063	0.249
	Oct.	--	--	--	

TABLE 16. Summation of surface- and ground-water appropriation, Water Resource Inventory Area 30 exclusive of Klickitat River basin, Klickitat County, Washington.

Year	Surface Water cfs	Surface Water acre-feet	Ground Water gpm	Ground Water acre-feet
1950	4.91	--	1800	637.0
1955	5.45	--	4030	221.4
1960	5.49	4.0	4840	3517.4
1965	4.70	44.0	5182	3651.5
1970	6.42	265.5	7362	5105.0
1975	7.07	288.5	9544	5834.1
1976	7.07	288.5	9544	5834.1

TABLE 17. Summation of surface- and ground-water appropriation, Alder Creek basin, Klickitat County, Washington.

Year	Surface Water cfs	Surface Water acre-feet	Ground Water gpm	Ground Water acre-feet
1950	--	--	--	--
1955	--	--	--	--
1960	--	--	1600	640.0
1965	--	--	1600	640.0
1970	--	--	1600	640.0
1975	--	--	8800	2515.0
1976	--	--	13,800	2515.0

TABLE 18. Summation of surface- and ground-water appropriation, Dead Canyon and Glade Creek basins, Klickitat County, Washington.

Year	Surface Water		Ground Water	
	cfs	acre-feet	gpm	acre-feet
1950	--	--	--	--
1955	--	--	200.0	160.0
1960	--	--	890.0	680.0
1965	--	--	890.0	680.0
1970	--	--	7490.0	7557.0
1975	--	--	40,490.0	12,251.0
1976	--	--	40,490.0	12,251.0

TABLE 19. Summation of surface- and ground-water appropriation, Rock Creek basin, Klickitat County, Washington.

Year	Surface Water		Ground Water	
	cfs	acre-feet	gpm	acre-feet
1950	--	--	--	--
1955	--	--	--	--
1960	0.4	--	50.0	20.0
1965	0.6	69.0	50.0	20.0
1970	0.63	73.1	2657.0	860.0
1975	0.69	100.1	7813.0	3516.9
1976	0.69	100.1	7813.0	3516.9

TABLE 20. Summation of surface- and ground-water appropriation, Wood Gulch basin, Klickitat County, Washington.

Year	Surface Water		Ground Water	
	cfs	acre-feet	gpm	acre-feet
1950	--	--	--	--
1955	--	--	--	--
1960	--	--	--	--
1965	--	--	--	--
1970	--	--	3150.0	2175.0
1975	0.015	1.0	3150.0	2175.0
1976	0.015	1.0	3150.0	2175.0

TABLE 21. Summation of surface- and ground-water appropriation, Chapman Creek basin, Klickitat County, Washington.

Year	Surface Water		Ground Water	
	cfs	acre-feet	gpm	acre-feet
1950	--	--	--	--
1955	0.26	50.0	2650.0	1010.0
1960	0.26	50.0	2650.0	1010.0
1965	0.26	50.0	2650.0	1010.0
1970	0.26	50.0	2650.0	1010.0
1975	0.26	50.0	2650.0	1010.0
1976	0.26	50.0	2650.0	1010.0

TABLE 22. Summation of surface- and ground-water appropriation, Old Lady Canyon basin, Klickitat County, Washington.

Year	Surface Water cfs	Surface Water acre-feet	Ground Water gpm	Ground Water acre-feet
1950	--	--	--	--
1955	--	--	--	--
1960	--	--	--	--
1965	--	--	--	--
1970	--	--	--	--
1975	--	--	12.0	2.0
1976	--	--	12.0	2.0

TABLE 23. Summation of surface- and ground-water appropriation, Pine Creek basin, Klickitat County, Washington.

Year	Surface Water cfs	Surface Water acre-feet	Ground Water gpm	Ground Water acre-feet
1950	--	--	--	--
1955	--	--	--	--
1960	0.24	48.0	--	--
1965	0.24	48.0	--	--
1970	0.25	49.0	9.0	2.0
1975	0.25	49.0	9.0	2.0
1976	0.25	49.0	9.0	2.0

TABLE 24. Summation of surface- and ground-water appropriation, Water Resource Inventory Area 31 exclusive of Rock Creek, Wood Gulch, Chapman Creek, Old Lady Canyon, Pine Creek, Alder Creek, Dead Canyon, and Glade Creek basins, Klickitat County, Washington.

Year	Surface Water		Ground Water	
	cfs	acre-feet	gpm	acre-feet
1950	0.01	--	200.0	111.0
1955	0.01	--	200.0	111.0
1960	0.09	22.0	200.0	111.0
1965	0.09	22.0	681.0	414.8
1970	0.09	22.0	2681.0	3614.8
1975	0.09	22.0	3831.0	3893.8
1976	0.09	22.0	3831.0	3893.8

SUMMARY

Klickitat County and the upper Klickitat River basin occupy an area in excess of 2200 square miles in south-central Washington. The area is a geographical transition zone between the Cascade Mountains on the west and the Columbia plateau to the east, and its transitional nature is evident in the area's climate, geology, and in the nature and occurrence of its water resources.

The climate of Klickitat County changes from humid and subhumid in the west to semiarid and arid in the east. Eastward migrating storms associated with low pressure systems dominate the county's weather in the winter months. During these months the weather is cool and wet. In the summer, high pressure dominates bringing warm and dry conditions to the area.

Most precipitation occurs as rain or snow during the winter months with annual rainfall decreasing markedly from west to east. Annual precipitation varies from 70 inches in the west to less than 10 in the east. Abundant precipitation also occurs in areas of high elevation with annual totals exceeding 100 inches on Mt. Adams in the northwest part of the study area. Precipitation is low in the Columbia River gorge because of its low elevation and the expansion of air flow east of the Cascade water gap. Long-term records reveal a cyclical distribution of precipitation.

Average monthly temperatures range from 65-70°F in July to 30°F in January. Temperature is also controlled by elevation with warmer temperatures occurring at lower elevations. Long-term temperature averages indicate temperatures lower than the mean during the 1920's and 1930's. Temperatures have remained at or near the mean for the last 15 years.

Water budget calculations done for several locations in the county reflect the areal variation in precipitation and temperature. Stations in the western part of the county have a large water surplus in early spring and small water deficits in the summer months. Conversely, locations in the east have low precipitation and high evapotranspiration resulting in a high water deficit and no water surplus.

Within the study area, four major geologic units are recognized. The oldest of these, the older volcanic and volcaniclastic rocks, consists of tuffs and tuff breccias with some interbedded basaltic and andesitic lavas. Exposure of these rocks is limited to the northwest corner of the county.

Overlying the older volcanics is a sequence of basalts of the Columbia River Group. These basalts are the most extensive unit in the study area and appear to thicken to the east. Units of the group exposed are those of the Wanapum and Grande Ronde basalts in the west and the Saddle Mountains Basalt to the east.

In protected areas, the Columbia River Basalt is overlain by a sequence of Tertiary-Quaternary sediments. In the central part of the county the sediments are mainly a quartzite conglomerate in a tuffaceous matrix. To the west the sediments contain less quartzite and more basalt and andesite.

The youngest geologic unit recognized is the younger volcanics present in the north and west part of the study area. This unit includes the Simcoe Mountain volcanics north of Goldendale and the younger basaltic and andesitic lavas associated with Mt. Adams and other eruptive centers to the west.

Distribution of surface-water resources is in direct relation to available precipitation within the study area. Very intermittent streams characterized by rapid runoff, wide discharge variation, and no sustained minimum flow are present in the arid eastern part of the study area. Conversely, streams in the west exhibit less discharge variation and substantial minimum flows sustained by ground-water discharge and snowmelt during the summer months. Streams in the county's central part represent a transition between the two extremes with high runoffs and low but sustained minimum flows. Peak flows for all streams occur in late winter months and minimum flows occur in late summer and early fall.

Ground-water resources appear more widely available throughout the study area than surface water. In the western third of the county, numerous springs exist, most issuing from permeable zones in the Columbia River Basalt and younger volcanics. In the rest of the county, wells are the primary ground-water source, and most obtain adequate supplies from permeable interflow zones in the Columbia River Basalt Group. In the Goldendale-Centerville area, irrigation wells capable of 1000-1500 gpm have been developed and well irrigation is extensive. In the Dead Canyon and Glade Creek areas, near the county's eastern edge, high production irrigation wells have been obtained, some of which flow in excess of 2000 gpm. Analysis of well hydrographs indicate that in most areas annual recharge appears sufficient to keep up with present demand. In the eastern part of the county, however, some evidence exists to indicate that recharge is insufficient, particularly in the Bickleton area.

Water quality within the study area appears to be good. Analysis of major streams within the county indicates most to have water of excellent quality. A few of the sample locations indicate coliform content to be higher than desirable, probably as a result of septic tank effluent and livestock grazing in close proximity to the stream.

Ground-water quality also appears to be generally good. A few wells in the younger volcanics appear to have a high iron content and wells located in sediments show some iron and hardness problems. Isolated instances of soda springs and wells are also found within the study area. These ground-water sources have a high chemical and mineral content and are undesirable for most domestic purposes. In general, however, water quality is good and, with adequate protection, should remain so.

A review of water-right claims for the study area reveals a total of 1015 claims. Of these, 594 claims are for a total of 568.55 cfs on surface water and 401 are for a 157,913.5 gpm of ground water. Many of the surface-water claims are long-standing and date back to the late 1800's when the area was first settled. Many of the ground-water claims have resulted from relatively recent interest in deep-well irrigation. An increase in the number of claims is noted in the last 10 years which is attributable in part to increased demand and to the Water Right Claim Regulation Act.

Most surface-water supplies are near fully appropriated and ground-water supplies will undoubtedly have to meet most of the future demand. Currently, ground-water supplies in much of the county appear adequate to meet this demand; however, care must be exercised in its development. Some areas, particularly in the eastern third of the county, appear to be marginal and extensive ground-water withdrawal could do serious harm. Thus, before substantial ground-water withdrawal is permitted in these areas its effects must be carefully assessed.

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APPENDIX A

Miscellaneous and Crest-Stage Discharge Measurements of Streams in Klickitat County an the Upper Klickitat River Basin.

TABLE A-1. Discharge Measurements Made at Miscellaneous Sites in Klickitat County, Washington

Location Number on Plates I & II	Station Name	Location	Date	Discharge (cfs)
1	Mill Creek	NW4SE4, sec. 10, T. 5 N., R. 15 E., at county road crossing, 0.2 mi. upstream from Devils Canyon, 6.5 mi. north of Blockhouse	12-11-69 3-11-70 4-14-70	3.47 11.70 16.50
2	Devils Canyon	NW4SE4, sec. 10, T. 5 N., R. 15 E., at road crossing, 0.2 mi. upstream from mouth, 6.5 mi. north of Blockhouse	12-11-69 3-11-70 4-14-70	.68 2.53 2.14
3	Mill Creek	SW4SW4, sec. 22, T. 5 N., R. 15 E., at county road crossing, 2.2 mi. downstream from Devils Canyon, 4.3 mi. north of Blockhouse	12-11-69 3-11-70 4-14-70	5.05 24.7 16.3
4	Blockhouse Creek	NW4NE4, sec. 10, T. 4 N., R. 15 E., at county roading crossing, 0.35 mi. upstream from unnamed tributary, 1.5 mi. northeast of Blockhouse	12-11-69 3-10-70 4-14-70	1.51 5.18 4.23
5	Blockhouse Creek	NE4SE4, sec. 9, T. 4 N., R. 15 E., 0.5 mi. upstream from unnamed tributary, 0.6 mi., northeast of Blockhouse	12-11-69 3-10-70 4-14-70	1.04 4.77 3.98
6	Blockhouse Creek	SE4NW4, sec. 16, T. 4 N., R. 15 E., at county road crossing, 0.2 mi. south of Blockhouse 3.5 mi. upstream from mouth	12-11-69 3-10-70 4-14-70	5.06 19.5 11.2
7	Blockhouse Creek	SE4NE4, sec. 19, T. 4 N., R. 15 E., 0.7 mi. upstream from mouth, 2.1 mi. southwest of Blockhouse	12-11-69 3-10-70 4-14-70	4.26 19.2 10.7

Location Number on Plates I & II	Station Name	Location	Date	Discharge (cfs)
8	Little Klickitat River	SE4, sec. 9, T. 4 N., R. 14 E., at gaging station .75 mi. above mouth and 2 mi. northeast of Wahkaicus	12-08-48	37.3
			1-19-49	103.
			2-26-49	1010.
			4-14-49	483.
			5-16-49	360.
			6-27-49	81.9
			7-26-49	44.8
			8-08-49	30.9
			12-01-49	58.9
			2-01-50	86.9
			3-12-50	415.
			4-05-50	445.
			5-20-50	246.
			7-10-50	67.2
			8-09-50	35.3
			9-20-50	36.6
9	Klickitat River	On line between sec. 24 and sec. 25, T. 6 N., R. 13 E., 0.1 mi. upstream from Summit Creek, at bridge on St. Regis Paper Co. road, 9.6 mi. southeast of Glenwood and at mile 36.8	8-14-74	1150.
			9-18-74	943.
			10-10-74	945.
			11-14-74	848.
10	Summit Creek	SW4SE4, sec. 24, T. 6 N., R. 13 E., 0.2 mi upstream from mouth, 9.6 mi. southeast of Glenwood	6-05-74	91.8
			7-16-74	32.8
			8-14-74	23.2
			9-18-74	17.8
			10-10-74	17.5
			11-14-74	18.1
11	Hell Roaring Irrigation Co. Canal	NW4, sec. 33, T. 8 N., R. 12 E., 10 mi. northwest of Glenwood	10-07-49	22.0
			6-15-48	1.06
			7-20-48	22.4
			8-25-48	732.

Location Number on Plates I & II	Station Name	Location	Date	Discharge (cfs)
12	Outlet Creek	NW4NW4, sec. 14, T. 6 N., R. 13 E., 0.2 mi. upstream from mouth, 6.4 mi. east of Glenwood	10-07-45	63.4
			8-15-74	124.
			9-17-74	125.
			10-09-74	111.
			11-14-74	109.
13	Outlet Creek	SE4SW4, sec. 9, T. 6 N., R. 13 E., 0.9 mi. upstream from Outlet Falls, 4.8 mi. east of Glenwood	10-07-45	0.0
			8-15-74	12.3
			9-18-74	4.25
			10-10-74	5.31
			11-15-74	6.82
14	Outlet Creek	SW4SW4, sec. 8, T. 6 N., R. 13 E., 4 mi. east of Glenwood	10-08-45	.05
15	White Creek	SE4SW4, sec. 11, T. 6 N., R. 13 E., 0.2 mi. upstream from mouth, 6.8 mi. east of Glenwood	11-12-73	62.0
			4-11-74	287.
			4-23-74	254.
			5-07-74	176.
			6-05-74	60.2
			7-16-74	7.63
			8-14-74	2.81
			9-17-74	1.5
			10-10-74	1.41
			11-14-74	2.61
16	Wonder Spring	E2, sec. 4, T. 6 N., 13 E., 1000 ft. above mouth, 5-1/2 miles northeast of Glenwood	6-19-52	14.2
			7-14-52	15.0
			8-02-52	12.8
			8-20-52	12.7
			9-23-52	13.1
17	Wonder Spring	SW4,NW4, sec. 3, T. 6 N., R. 13 E., 0.2 mi. upstream from mouth, 0.4 mi. southeast of Klickitat State Fish Hatchery, 5.7 mi. east of Glenwood	6-05-74	22.4
			11-14-74	19.7

Location Number on Plates I & II	Station Name	Location	Date	Discharge (cfs)
18	Indian Ford Springs #1	Sec. 4, T. 6 N., R. 13 E., 1000 ft. above former gaging station, 200 ft. above mouth and 5¼ mi. northeast of Glenwood	1-11-49	15.9
			1-12-49	17.7
			10-08-45	13.7
			1-20-46	15.7
			3-07-46	19.1
			3-30-46	20.9
			6-21-46	15.8
			8-11-46	22.0
			9-24-46	16.5
19	Indian Ford Springs #2	N2NE4, sec. 4 T. 6 N., R. 13 E., 5.5 mi. northeast of Glenwood	10-08-45	1.11
			1-20-46	2.26
			3-07-46	3.35
			3-30-46	3.7
			5-23-46	4.22
			6-21-46	3.28
			8-11-46	2.8
			10-03-46	2.41
			10-08-46	3.67
			11-11-46	2.92
			2-16-47	3.45
			3-26-47	4.02
			4-04-47	3.52
			5-03-47	2.96
			6-22-47	3.36
			8-20-47	2.52
			9-02-47	2.85
20	Unnamed Springs	NE4, sec. 4, T. 6 N., R. 13 E., at mouth, across river from fish hatchery, 5¼ mi. northeast of Glenwood	7-14-52	16.9
			8-02-52	15.7
21	Elk Creek	SW4NW4, sec. 4, T. 6 N., R. 13 E., Klickitat County, at road crossing 1.5 mi. west of Klickitat State Fish Hatchery, 0.1 mi. above mouth	10-09-74	0.07
			11-14-74	0.04

Location Number on Plates I & II	Station Name	Location	Date	Discharge (cfs)
22	Trout Creek	SE4NE4, sec. 5, T. 6 N., R. 13 E., 0.2 mi. upstream from mouth, 0.7 mi. west of Klickitat State Fish Hatchery, 4.7 mi. east of Glenwood	6-05-74	36.6
			7-16-74	17.8
			8-14-74	11.8
			9-17-74	9.26
			10-10-74	5.41
			11-14-74	4.86
23	Little Buck Creek	E2, sec. 5, T. 3 N., R. 10 E., at forks near Underwood	10-07-42	0.17
24	Spring Creek	SW4SW4, sec. 25, T. 4 N., R. 10 E., 300 ft. upstream from mouth, 0.8 mi. west of Husum	8-23-73	11.2
25	Rattlesnake Creek	NW4NW4, sec. 31, T. 4 N., R. 11 #., 50 ft. upstream from mouth at Husum	8-23-73	0.86
26	Rattlesnake Creek near Husum	SE4SW4, sec. 10, T. 4 N., R. 11 #., at road bridge 4.7 mi. northeast of Husum	10-24-69	1.57
			12-12-69	5.79
			1-05-70	180.
			3-04-70	99.1
			4-14-70	23.0
			6-03-70	4.79
			7-09-70	0.96
			8-20-70	0.38
			10-06-70	1.1
			11-17-70	4.27
			12-22-70	14.9
			2-23-71	105.
			4-09-71	180.
			5-27-71	10.1
			7-07-71	3.27
			8-19-71	0.66
			10-06-71	1.26
			11-15-71	3.06
			1-04-72	21.8
			3-10-72	274.

Location Number on Plates I & II	Station Name	Location	Date	Discharge (cfs)
26	(continued)		4-24-72	31.0
			6-14-72	4.51
			8-02-72	0.62
			9-20-72	1.14
			8-23-73	0.05
			10-16-73	0.87
			12-06-73	91.9
			1-22-74	28.2
			3-07-74	185.
			4-26-74	40.0
			6-27-74	2.94
			8-21-74	0.44
			10-17-74	0.50
			12-10-74	4.88
			2-04-75	80.9
			4-02-75	113.
			5-28-75	8.34
			7-23-75	0.63
			9-17-75	0.32
27	Trout Lake Creek	SE4SW4, sec. 15, T. 6 N., R. 10 E., 150 ft. upstream from road crossing, 2 mi. upstream from mouth, 0.6 mi. northwest of Trout Lake	8-23-73	35.1
28	Holmes Creek	SE4SE4, sec. 2, T. 5 N., R. 11 E., Klickitat County, 200 ft. above county road crossing, 0.4 mi. northwest of Laurel	10-11-74	2.4

TABLE A-2. Discharge Measurements at Miscellaneous Sites in the Upper Klickitat Basin.

Location Number on Plate III	Station Name	Location	Date	Discharge (cfs)
1	Klickitat River	SW4SW4, sec. 13 , T. 7 N., R. 12 E., Yakima County, 0.6 mi. downstream from Dairy Creek, 5.1 mi. north of Glenwood and at mile 50.3	8-13-74	839.
			9-18-74	540.
			10-10-74	514.
			11-15-74	463.
			5-29-75	2180.
2	Elk Creek	SE4NE4, sec. 32, T. 7 N., R. 13 E.	11-14-74	.0
3	White Creek	NW4NW4, sec. 9, T. 7 N., R. 14 E.	10-09-74	.02
4	Brush Creek	NW4NW4, sec. 15, T. 7 N., R. 14 E.	10-09-74	.07
5	Bird Creek	SW4SW4, sec. 28, T. 7 N., R. 12 E., Yakima County, 33 mi. northwest of Glenwood and 1.0 mi. above Dry Creek	10-08-74	4.0
			10-13-74	3.8
6	Dry Creek	NW4NW4, sec. 28, T. 7 N., R. 12 E.	9-12-74	0.0
			10-08-74	.0
7	Dairy Creek	South Branch NE4SE4, sec. 8, T. 7 N., R. 12 E.	6-10-74	2.
			7-09-74	.5
			10-08-74	.1
8	Dairy Creek	Middle Branch NW4NW4, sec. 9, T. 7 N., R. 12 E.	6-10-74	5.
			7-09-74	3.
			10-08-74	0.3
9	Creek	North Branch NW4SW4, sec. 4, T. 7 N., R. 12 E.	6-10-74	2.
			7-09-74	1.5
			10-08-74	0.2

Location Number on Plates III	Station Name	Location	Date	Discharge (cfs)
10	Hell Roaring Ditch	NE4SE4, sec. 8, T. 7 N., R. 12 E., Yakima County, at County Road crossing 6.3 mi. north of Glenwood	5-02-74	23.7
			6-06-74	.22
			7-09-74	7.4
			7-16-74	18.2
			8-13-74	74.5
			9-18-74	57.2
			10-10-74	3.06
			11-15-74	.95
11	Hell Roaring Irrigation County Canal	NW4, sec. 33, T. 8 N., R. 12 E., 10 mi. northwest of Glenwood	10-07-49	22.0
			6-15-48	1.06
			7-20-48	22.4
			8-25-48	73.2
12	Bacon Creek	North Branch SE4NE4, sec. 7, T. 7 N., R. 12 E.	6-11-74	1.5
			7-09-74	.45
			7-16-74	.51
			8-14-74	.33
			9-09-74	.20
			10-08-74	.10
			11-13-74	.10
13	Cunningham Creek	NW4SE4, sec. 15, T. 8 N., R. 12 E., Yakima Indian Reservation, 0.8 mi. above mouth, 11.2 mi. north of Glenwood	8-25-73	10.8
14	Chaparral Creek	SW4NW4, sec. 1, T. 9 N., R. 12 E., Yakima Indian Reservation, 0.2 mi. north of Glenwood	8-25-73	0.2
15	Chaparral Creek	Camp Chaparral SW4NE4, sec. 2., T. 9 N., R. 12 E.	8-15-74	0.6
16	Pearl Creek	NE4NW4, sec. 36, T. 10 N., R. 12 E., Yakima Indian Reservation, at mouth, 20.5 mi. north of Glenwood	8-25-73	0.0

Location Number on Plate III	Station Name	Location	Date	Discharge (cfs)
17	McCreedy Creek	SE4NE4, sec. 25, T. 10 N., R. 12 E., Yakima Indian Reservation, 300 ft. upstream from mouth, 21.2 mi. north of Glenwood	8-25-73	23.8

TABLE A-3. Maximum Discharge at Crest-Stage Partial-Record Stations in Klickitat County and the Upper Klickitat River Basin.

Station Number	Station Name	Location	Drainage area (mi^2)	Date	Gage Height (ft)	Discharge (cfs)
14034325	Alder Creek near Bickleton, Wash.	NE4NW4, sec. 23, T. 6 N., R. 20 E., at county road 1.3 mi. east of Bickleton	8.35	2-03-63	13.05	880
				1-25-64	6.86	58
				1-16-64	13.42	973
				1-16-71	8.49	234
				1-20-72	9.00	293
				1-13-73	8.54	240
				1-16-74	13.68	992
				3-01-75	7.83	165
14110000	Klickitat River near Glenwood, Wash.	SE4, sec. 14, T. 7 N., R. 12 E., 0.4 mi. downstream from Dairy Creek and 5.2 north of Glenwood	360.00	5-30-72	6.66	4870
				12-21-72	6.09	3770
				1-15-74	7.34	7600
				1-02-75	5.98	4800
14110700	Medly Canyon Creek near Glenwood, Wash.	NE4SE4, sec. 4, T. 5 N., R. 12 E., at county road 5 mi. south of Glenwood	1.26	1-23-70	4.98	32
				2-15-71	4.61	22
				1-20-72	6.76	49
				12-21-72	2.96	6.2
				1-15-74	6.72	84
				2-13-75	3.71	15
14111800	West Prong Little Klickitat River near Goldendale, Wash.	NE4, sec. 18, T. 5 N., R. 17 E., at private logging road 9 mi. northeast of Goldendale	10.40	2-09-61	11.69	192
				12-24-61	6.98	38
				2-03-63	8.78	98
				1-25-64	6.90	37
				12-22-64	16.16	569
				4-01-66	7.24	45
				1-28-67	8.27	77

Station Number	Station Name	Location	Drainage area (mi^2)	Date	Gage Height (ft)	Discharge (cfs)
14111800 (continued)				2-23-68	10.34	144
				1-07-69	8.10	72
				1-23-70	11.80	182
				1-16-71	9.06	105
				1-20-72	13.27	218
				1-13-73	7.63	56
				1-15-74	---	495
				2-12-75	10.20	138
14112000	Little Klickitat River near Goldendale, Wash.	NE4SW4, sec. 10, T. 4 N., R. 16 E., 400 ft. upstream from state Hwy. 97 bridge and 2.1 mi. northeast of Goldendale	83.50	1-16-71	6.06	1340
				1-20-72	8.75	3290
				12-21-72	4.55	720
				1-15-74	10.61	4800
				2-12-75	3.86	418
14112200	Little Klickitat River tributary near Goldendale, Wash.	NW4, sec. 15, T. 4 N., R. 16 E., at county road 1½ mi. northeast of Goldendale, Wash.	0.71	2-09-61	10.10	50
				2-17-62	7.31	8.9
				2-03-63	11.00	192
				1-25-64	7.68	14
				12-23-64	11.14	229
				1-08-66	7.81	16
				1-28-67	7.67	14
				2-23-68	7.94	18
				3-17-69	7.71	14
				1-23-70	9.06	34
				1-16-71	9.71	48
				1-20-72	10.43	58
				1-13-73	8.64	30
				1-15-74	10.70	153
				2-12-75	8.09	21

Station Number	Station Name	Location	Drainage area (mi^2)	Date	Gage Height (ft)	Discharge (cfs)
14112400	Mill Creek near Blockhouse, Wash.	NW4SW4, sec. 5, T. 4 N., R. 15 E., on left bank 1.9 mi. northwest of Blockhouse and 3.5 mi. upstream from mouth	26.90	1-22-72	3.44	38
				1-15-74	5.44	430
				2-12-75	3.38	105
14112490	Bowman Creek near Wahkiacus, Wash.	SE4NW4, sec. 10, T. 4 N., R. 14 E., at road crossing 0.5 mi. downstream from Canyon Creek, 0.5 mi. upstream from mouth and 3.2 mi. northeast of Wahkiacus	60.10	1-15-74	697.79	1950
				1-25-75	686.23	316
14122800	Phelps Creek near B-Z Corner, Wash.	NE4NW4, sec. 35, T. 5 N., R. 10 E., at state hwy. 141, 2.5 mi. north of B-Z Corner	1.88	1-23-70	13.44	97
				2-15-71	12.38	60
				1-20-72	13.42	96
				12-21-74	12.38	60
				1-16-74	15.56	215
				2-13-75	12.06	33
14034320	Dead Canyon tributary near Alderdale, Wash.	On N2 line between sec. 14 and 15, T. 5N., 0.62 R. 23E., 6 mi. north of Alderdale	0.62	1955*	---	++
				1956*	---	++
				1957*	---	++
				1958*	---	++
				1959*	---	++
				1960*	---	++
				1961*	---	++
				1962*	8.49	2.1
				1963*	---	++
				1964*	---	++
				12-22-64	10.13	17
				1966*	---	++
				1967*	---	++
				1968*	---	++

Station Number	Station Name	Location	Drainage area (mi^2)	Date	Gage Height (ft)	Discharge (cfs)
14034320	(continued)			2-11-69	9.36	9.2
				1970*	---	++
				1971*	---	++
				1972*	---	++
				1973*	---	++
				1-16-74	13.60	12

* Water year

++ No evidence of flow

APPENDIX B

Well Inventory, Klickitat County, Washington

Appendix B is a partial inventory of wells within Klickitat County. Altitude is in feet above mean sea level and depth is in feet below land surface. Static water-level measurements listed to significant figures were obtained during the course of this study or from U. S. Geological Survey records. All other water levels listed were obtained from dilling logs and/or other sources for which the measurement accuracy is unknown. Use code is D-domestic, I-irrigation, N-industrial, M-municipal, U-unused, S-stock, and T-test well.

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Water Level Below Land Surface Date	Use	Yield (gpm)	Remarks
					T. 2 N. R. 12 E.						
3G1	Spokane, Portland & Seattle RR	80	340	10	60	Basalt	50	8/22/29	N	300	
3J1	Lyle Water Co.	90	80	10		Gravel	35	12/26/34	M	100	
					T. 2 N. R. 13 E.						
6D1	Dayton Henderson	1200	160	6	158	Interbedded Sediments	111	6/05/72	D	28	Deepened - SWL was 42' Temp 13.5°C
16L1	Cecil Odom	300	191	6	53	Vesicular Basalt	127	6/30/75	D	5	SWL was 48' 4/21/70 Temp 11°C
16L2	Ivor Jones	360	315	6	20	Vesicular Basalt	157	6/02/73	D	25	Deepened from 205' - SWL was 130' Temp 16.5°C
16L3	Robert G. Knowles	350	250	6	26	Vesicular & Fractured Basalt	183	6/30/72	D	17	Temp 17°C
16L4	George McKinnon	350	175	6	22	Vesicular Basalt	119	10/24/72	D	60	Deepened from 142' - SWL was 100' Temp 11°C
16M1	A. J. Bradley	240	74	6	14		3.4	7/07/75	D	5	SWL at surface in winter
16P1	Orison C. Murdock	300	128	8	49	Basalts & Interbedded Sediments	80	1/02/53	D	25	
16P2	Samuel L. Dean	280	20	42		Sand and Gravel	14	9/14/55	D	18	
16P3	Frank Healey	280	130	6	19.5	Vesicular Basalt			D	12	Temp 11°C
16R1	Karl F. Moore	260	107	8	14	Fractured Basalts & Interbedded Sediments	Flow	4/01/60	D	75	Flows inter-mittently

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
21R1	Donald E. Graves	250	140	8	140	Gravel	110.4	6/07/75	D,I	100	Temp 11°C
22F1	Fred Smith	320	500	12	90	Fractured Basalt	200	12/23/73	I	700	Temp 16°C
22P1	W. H. Gregory	280	285	10	20	Fractured Basalt	77	5/18/73	N	800	
24C1	North Cloud	450	65	6			25	7/08/75	D		
25N1	Klickitat Co.	220	210	6	210	Basalt	70	7/07/70	N	250	Capped & Abandoned Temp 6°C
27B1	Lawrence Tidyman	235	280	10	20	Vesicular Basalt	86	00/00/53	I	1000	
28A1	Akira Ogawa	190	169	8	115	Basalt & Clay	66	3/22/66	I	80	12 GPM at 90' Temp 15.5°C
28F1	Harry Toda	180	170	8	170	Basalt & Interbedded Sediments	79	10/18/72	D	25	
28G1	Frank Toda	210	100	8	98	Gravel	65	2/02/53	D	160	
28J1	Owen Sisson	195	189	8	44	Basalt	137	3/22/66	P	50	Temp 8°C
28Q1	Bud Williams	190	205	6	19	Vesicular Basalt	119	12/01/71	D,I	50	
28R1	Tom Williams	190	187	8	8	Basalt	120	2/00/55	D		Water at 80' and 187'
28R2	Cecil L. Odom	190	90	6	40		3	7/30/63	D	10	Well was polluted until casing was cemented into basalt. SWL lowered as result.
33C1	Dalles Port Dev. Co.	170	110	6	20	Vesicular Basalt	40	8/25/70	P	1	Temp 12°C
33R1	Spokane, Portland & Seattle RR	127	148	6	8		93.6	3/22/66	U	45	
34E1	C. T. Smith	220	260	12			188.9	3/23/66	P		Temp 12°C
34L1	Dalles City	235	541	8	42	Basalt	207.8	3/23/66	P	85	SWL was 158' in 1932

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
						T. 2 N. R. 14 E.					
19F1	U.S. Corps of Engineers	180	105	8	105	Gravel	26.1	9/08/75	P	300	Temp 11.5°C
						T. 2 N. R. 15 E.					
7M1	Coffield & Sons	1200	267	8	240	Fractured Basalt	101	3/08/68	I,P	150	Deepened from 98' Temp 12°C
17M1	Spokane, Portland & Seattle RR	172	301	14	107	Fractured Basalt	33.95	5/26/30	U	200	
17M2	Spokane, Portland & Seattle RR	171	399	16	154	Vesicular Basalt	36	5/26/30	N	835	
17M3	Spokane, Portland & Seattle RR	169	475	12	39	Basalt	49.5	5/22/30	N	750	
18P1	Otis Smith	400	160	8					D,I		
						T. 2 N. R. 16 E.					
3D1	Lee Ritter	180	130	6	66	Fractured Basalt	47	3/28/72	D	10	Temp 10°C
3D2	George Gunkel	180	52	6	51	Sand and Gravel	18	3/30/72	D	60	Temp 10°C
3D3	Lee Ritter	180	250	6	19	Vesicular Basalt	77	4/06/72	D	60	
4F1	James W. Howe	180	50	10	47	Sand and Gravel	30	4/28/69	I		
4F2	William F. Coffey	180	52	6	50	Sand and Gravel	23	4/11/70	D	125	Temp 11°C
4M1	S. Tsubota	181	41	60	41	Sand and Gravel	17.7	3/21/66	I	1300	
4M2	U.S. Corps of Engineers	180	51	8	51	Sand and Gravel	13	8/25/60	P	175	SWL reported to be at same level as Dalles pool Temp 14.5°C

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
						T. 3 N. R. 10 E.					
2B1	Pacific Power & Light Co.	380	40	6	27	Gravel	5	11/24/73	P	40	Temp 14.5°C
13J1	Mae S. Wedrick	1080	18	36	9	Alluvium	13	10/26/61	D	3	Temp 2°C
13R1	A. F. Moore	800	543	5	538	Fractured Basalt	442	12/13/68	D,I	20	Temp 10°C
						T. 3 N. R. 11 E.					
5N1	Richard Orthman	1480	290	6	30	Interbedded Sediments	124.8	6/24/75	D	8	
5N2	Stan Hammond	1480	300	6	75	Gravel	200	5/30/75	D	5	
5P1	Fred A. Heany	1690	240	6	19	Weathered Basalt	80	3/11/74	D	9	
6L1	L. Huszar	1200	165			Basalt	100.4	6/27/76	D		
7B1	Merlin Yarnell	1330	175	6	116	Fractured Basalt			T	5	
7G1	J. A. Spring	1240	150			Basalt			D	37	
7Q	W. Snoksdoff	1040	83	6	40	Fractured Basalt	65	11/17/73	D	90	
8D1	Robert Allen	1640	82	6	82	Fractured Basalt			D		
8D2	Robert Allen	1640	80	6	60	Interbedded Sediments	15	5/19/74	D	8	
8E1	Dennis Peoples	1640	400	6	79	Basalt	320	7/25/74	D	3	
8K1	Bob Jarvis	1785	80	4		Basalt	25.3	10/09/75	D		
9A1	Lynn Comer	1910	180	6	41	Interbedded Sediments	78.1	10/08/75	D	4	SWL 45' on 5/21/74
9R1	Gilbert Randall	1950	95	6	83	Sand	41.2	10/13/75	D	12	
10C1	Charles A. Saylor	1860	225	6	52	Vesicular Basalt	131	3/15/73	D	10	Temp 13°C
10D1	Robert B. Tetreault	1900	28	36	26	Alluvium	19	10/15/67	D	10	
10J1	Fred Hause	1965	120	6		Basalt	20	10/08/75	D		Pumping level 35' - SWL from owner's memory

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
10Q1	Fred A. Heany	1965	176	6	147	Basalt & Clay			D	3	
11N1	Bruce Amoss	1996	148	6	148	Vesicular Basalt	47	11/09/74	D	6	Pumping level reported to be 80'
11P1	Dick Clack	2000	153	6	145	Basalt & Clay	40	9/18/74	D	10	
15A1	Roger Ordway	2000	70	6		Interbedded Sediments	23	10/10/75	D	40	SWL from owner's memory
15B1	Ralph Huitt	1930	185		57	Basalt	50	1975	U	100	
15B2	Butch Yarnell	1960	170	6					D		Reported to have low capacity
15C1	Victor Jaksha	1960	215	6		Basalt & Clay	90	1975	D	18	SWL from owner's memory
17J1	Glen C. Wildebour	2190	140	6	64	Weathered Basalt			D	10	Temp 11.5°C
18B1	John LaFollette	1050	280	6	140	Fractured Basalt	165	11/09/70	D	12	Temp 11°C
18C1	H. B. Larsen	1000	300	16	300	Weathered Basalt & Clay	100	10/15/70	I	60	
18F1	Merlin Yarnell	920	15			Alluvium	0.0	6/24/75	U		
18F2	Klickitat County Cemetery	920	61	6	20	Basalt	10	1/07/65	I	50	
18F3	Merlin Yarnell	920	335	8	35	Basalt	90	6/18/68	D,I	125	
18F4	Klickitat Co. Cem.	920	275	8	33	Basalt	145	7/17/69	I		
18K1	Jack Prine	900	235	6	49	Interbedded Sediments	200	9/01/70	D	18	Temp 12°C
18L1	Robert L. Dunn	900	290	6	40	Fractured Basalt	130	7/03/70	D	2	Temp 12°C
18L2	P. L. Thompson	880	185	6	105	Basalt	80	7/24/68	D	25	
18P1	Charles L. Jeter	890	190	6	39	Interbedded Sediments	170	7/09/70	D		
18P2	James E. Barnedt	880	183	6	183	Fractured Basalt	96	5/27/71	D,I	35	
20D1	Don Ramsay	2000	160	6	126	Weathered Basalt	80	3/17/74	D	12	

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
21D1	Clark	2165	186	6		Vesicular Basalt	148	10/08/75	D		
23M1	Marion E. Stauch	1975	12.5	53		Alluvium	9.5	10/10/61	D	12	Temp 9°C
28D1	Don Ramsay	2250	600	6	63				U		Dry Hole
29E1	City of Bingen	490	410			Basalt	296.8	10/09/75	U		Reported SWL of 95' 5/28/70
29M1	City of Bingen	360					70	10/09/75	U		
30F1	Underwood Fruit Co.	120	265	14	29	Fractured Basalt	Flow	9/08/55	U		Deepened to 332' on 3/30/61, abandoned and plugged
30F2	Underwood Fruit Co.	120	257	8	185	Fractured Basalt	41	10/19/72	N	500	
30J1	City of Bingen	340	300			Basalt	63	10/09/75	U		
30R1	S.D. & S. Lumber Co.	100	252	12	75	Fractured Basalt	64	10/09/75	N	475	SWL 60' at 157' depth
34Q1	Lyle Trailer Court	150		6			50.9	7/28/75	U		
					T. 3 N. R. 12 E.						
1E	Robert Schwagerl	2020	130	6	65	Vesicular Basalt	28	9/13/73	D,I	30	Temp 11°C
1N1	John Stephens	1880	375	6	19		4	10/13/72	D	8	Deepened 100' to 375' on 11/14/74 Temp 12°C
3R1	Cascade Pacific Properties	1950	280	6	24	Vesicular Basalt	33	1/26/73	D	3	Temp 11°C
4E1	Leis	2331	40			Alluvium	12.4	10/10/75	D		
6K1	H. Robert Cole	2330	110	6	83		55	7/05/74	D	13	Temp 11°C
13G1	James Block		200	6	19				T		No Water
13Q1	Bob Jellum	1350	205	6	19				T		No Water
13Q2	Bob Jellum	1350	250	6	19				T		No Water
15G1	Francis H. Keyes	1440	85	6	25		10	9/20/69	D	12	Temp 11°C
21H1	Ed Wegner	1040	175	6	50	Fractured Basalt	105	7/30/74	D	7	Temp 11°C
21K1	J. Shepherd	1038	300	6			236.6	10/10/75	D	4	

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Water Level Below Land Surface Date	Use	Yield (gpm)	Remarks
21K2	J. Shepherd	1038	530	6	59	Vesicular Basalt	450	7/01/74	U	10	
27N1	Boolin	570	111	6	110	Fractured Basalt	57.05	10/09/75	D		
27N2	J. Brubaker	500	25	36		Alluvium	7.85	6/15/75	D		
27N3	J. Brubaker	540	30	6		Alluvium	5.5	6/15/75	U		
27N4	J. Brubaker	540	73	6	72	Gravel	46.5	12/16/74		25	
28P1	Ed Cole	520	235	6	34		25	10/28/71	D	12	Temp 13.5°C
28P2	Mike Wilkins	520	250	6	18	Fractured Basalt	40	7/17/72	D	6	Water level approx.
28P3	Mike Wilkins	530	120	6	18	Fractured Basalt	8	2/22/74	D	5	
32A1	Dennis Clark	480	340	6	26	Fractured Basalt	270	4/05/71	D	30	Temp 12°C
32H1	Wash. Dept. of Highways	300	250	10	250	Fractured Basalt	173.8	2/02/68	D	50	Temp 13.5°C
					T. 3 N. R. 13 E.						
5B1	Harry Miller	400	55	6	38	Fractured Basalt	10	2/21/74	D	50	Temp 11°C
8L1	D. Whitten	320	35				9.1	7/28/75	D	8	Pump operating during water level measurement.
8L2	R. McMurrin	320	18			Alluvium	10.3	7/28/75	D,I		
15C1	Beattie Ranch	2000	250	6	37	Vesicular Basalt	101	8/01/74	D	8	Temp 12°C
23L1	Doug Taylor	1800	204	6	29	Vesicular Basalt	35	6/16/73	D	20	Water encountered at 55' Temp 13.5°C
25B1	Harry W. Hoyes	2020	205	6	113		171	10/28/71	D	17	Temp 12°C
28L1	E. H. Struck	1550	90	8	43	Clay	8	12/26/72	D	40	Temp 12°C
31L1	Wallace Regets	1250	245	6	220	Sand and Clay	177	9/24/74	D	20	Temp 14.5°C
31N1	Clara Palmer	1200	115	6	115	Gravel	43	4/14/72	D	30	

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Water Level Below Land Surface Date	Use	Yield (gpm)	Remarks
31N2	Don Johanson	1200	235	6	235	Sand and Clay	175	5/25/72	D	24	Temp 13.5°C
31N3	Ed G. Woods	1180	280	6	254	Vesicular Basalt	199	9/06/73	D	45	Temp 11°C
					T. 3 N. R. 14 E.						
3P1	Hartford Land Corp.	1860	220	6	24	Fractured Basalt	101	7/21/74	D	4	Temp 12°C
9Q1	Alvin Randall	1980	415	6	19	Fractured Basalt	214	11/01/74	D	3	Geophysical logs Deepened from 250' Temp 11°C
9Q2	Alvin Randall	2000	145	6	19				T		No Water
12J1	Virginia Fahlenkamp	1840	232	6	22	Clay interbed	37	10/29/75	D	150	
14N1	Alvin Randall	1720	300	6	120	Fractured Basalt	110	8/05/68	D	15	Well deepened from 112' 8/5/68 SWL was 99' Temp 12°C
14R1	Arnold Hoikka	1700	72	8		Sand	7.25	10/29/75	D		
18M1	Harold Sorenson	2140	900	6			700	10/21/65	U	25	Reported SWL
19L1	Carl Parrish	1870	150	6			126.95	10/21/65	D	Low	
19L2	Carl Parrish	1870	310	6	19	Vesicular & Fractured Basalt	83	10/16/72	D	7	Temp. 11°C
24C1	Arnold Hoikka	1645	110	8	47	Basalt & Interbedded Sediments	36.65	10/29/75	D	20	
24P1	L. D. Haverstick	1590	90		16		37	4/15/75	D		SWL approx.
25C1	Roy Mattson	1560	80	6			21	10/29/75	D		
26K1	Unknown	1580	63	6			7.2	10/29/75	U		
29B1	Jim Heglin	1650	332	6	87	Vesicular Basalt	55.34	10/29/75	D	0.5	Geophysical Logs Temp 11°C
					T. 3 N. R. 15 E.						
1R1	Calvin Linden	1610	77	8			12.6	10/28/75	D	20	Temp 12°C

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
2J1	Randy Enyeart	1570	400	6	19.5	Fractured & Vesicular Basalt	6.00	9/28/76	D	20	Temp 12°C Geophysical Logs
3J1	Calvin Linden	1680	622	8	34	Fractured Basalt	15.4	11/18/66	I	50	Temp 13.5°C
3N1	Joe Crocker	1700	110	6		Clay Interbed	17	3/16/72	D	17	Casing to 19' Temp 11°C
4H1	Ray Beyerlin	1745	70	8			19.76	10/29/75	D		
5L1	Peter Anderson	1860	115	8	8		Flow	10/27/75	D		Temp 12°C
7D1	Virginia Nygaard	1950	310	6	20	Vesicular Basalt	170	5/01/72	D	20	Deepened to 310 5/06/72
7Q1	Glen Smith	1650	46	6			1.2	10/29/75	U		
8R1	Harold Isaacson	1630	95	6		Basalt & Interbedded Sediments	17.28	10/19/65	D		Temp 12°C
8R2	Harold Isaacson	1630	70	6	50	Vesicular Basalt	12	5/30/74	D,I		
10R1	Ed Bean	1605	100	6	26	Vesicular Basalt	20	8/03/71	D,I	60	Temp 13.5°C
11C1	Bill Cameron	1625	133	6			8.23	10/29/75	D		
11C2	Cameron Brothers	1625	282	6	86	Vesicular & Fractured Basalt	4.6	10/29/75	D	60	Temp 14.5°C
11N1	Harry Emerson	1600	100	6	47	Vesicular Basalt	28	5/03/71	D	15	Temp 14.5°C
11N2	Clarence Lande	1595	90	6	40	Clay Interbed	30	10/29/75	D	25	Temp 11°C
12A1	Calvin Linden	1600	170	10	41	Fractured Basalt	11.35	10/12/65	I	60	Plugged at 170' Temp 11°C
12R1	Stewart Basse	1600	337	8	57	Fractured Basalt	12	10/17/66	I	250	Temp 13.5°C
13B1	Stewart Basse	1595	232	8	42	Fractured Basalt, Sand & Gravel	8.1	10/28/75	I	830	
13C1	Stewart Basse	1595	232	8	42	Vesicular Basalt	12.32	10/20/75	I		

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
14D1	Centerville Grange	1600	110	6	40	Gravel	38	11/25/60	D	60	Reportedly sealed & buried because of contamination
14D2	Lehto & Thompson	1600	85	6		Fractured Basalt	30	8/15/73	D	25	Deepened from 67' to 85' -- 8/13/73 Temp 12°C
15A1	E. W. Basse	1595	102	6			27.16	10/29/75	U		
15B1	John Harju	1595	92	6	35	Vesicular Basalt	19.9	10/28/75	D	30	Deepened from 42' Temp 11°C
17Q1	Glen Smith	1595	83	6			15.64	10/28/75	D		
18Q1	Glen Smith	1600	60	6		Basalt	43.15	10/28/75	U		
19J1	Glen Smith	1565	102	6	52	Fractured Basalt & Sediments	5.74	10/28/75	D,I	100	
20H1	Henry A. Miller	1570		6			3.84	10/28/75	S		
20L1	Quentin Jaekel	1560	262	8	73	Gravel, Sand & Clay	41.5	10/28/75	I,S	400	Well flowed when drilled
21B1	Lyle Woods	1580	70	10	42	Sand & Gravel	2.5	10/14/49	I	125	
22H1	Centerville Grange	1600	110	6	100	Clay & Gravel	41.1	10/28/75	I	60	Temp 12°C
22H2	Wash. Dept. of Natural Res.	1590	616	12	286	Fractured Basalt	9.50	5/18/76	I	1160	Temp 16.5°C Geophysical Logs
26B1	M. H. Eshelman	1635	120	6	120	Sediments	49.15	10/29/75	D		
28A1	Frank Garner	1590	85	6			13.60	9/18/75	U		
28M1	William Garner	1630	90	8	80	Gravel	51.94	10/28/75	I	160	
28P1	William Garner	1640	311	8	208	Fractured & Vesicular Basalt	62.73	4/15/75	I	200	
29G1	Wash. Dept. of Natural Res.	1615	900	16	300		124.5	1/27/76	U	450	Deepened from 605' Geophysical Logs Temp 17°C
32C1	E. T. Morran	1690	175	6			97.61	10/18/65	D		Temp 12°C Well being pumped during water level measurements

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
33A1	G. B. Ritzchke	1675	195		98	Gravel	55	00/00/54	D		
					T. 3 N. R. 16 E.						
2D1	Chuck Young	1780	195	6	27	Fractured & Vesicular Basalt	18	8/15/73	D	45	Temp 11°C
3B1	Clyde M. Story	1750	85	8	71	Vesicular Basalt & Clay	28.01	10/29/75	D	60	Temp 11°C
3F1	Marion Campbell	1730	430	6	35	Vesicular & Fractured Basalt	27	8/17/73	D	50	Temp 11°C
3L1	V. Stenbolm	1620	430	8	30		9	8/20/76	U		Geophysical Logs
4C1	Gerard A. Hanlon	1760	130	6	40		95	8/23/72	D	10	Temp 11°C
4H1	Bert Beyerlyn	1680	100				32.95	10/28/75	D	6	Temp 17°C
4P1	C. A. Gronewald	1680	63	6		Clay & Sand	16.69	10/29/75	D	6	
5A1	O. L. Hamilton	1725	70	5			49.16	10/05/65	D		Temp 12°C
5J1	Ross Crafton	1710	62	6			29.45	10/18/65	D		
7E1	Frank Linden	1615	150	6			32.45	10/28/75	S		Well depth estimated
7Q1	Stewart Basse	1590	302	12	120	Fractured Basalt	32.45	10/27/75	I		
8J1	Frank Linden	1660	352	12	120	Fractured Basalt	44.68	10/27/75	I		
8K1	Frank Linden	1630	150	8	72	Fractured Basalt	13.63	10/12/65	D	50	Temp 12°C
8K2	Frank Linden	1630	180	8	119	Fractured Basalt & Interbedded Sediments			D		
8K3	Frank Linden	1630	316	8	110	Fractured Basalt	32.33	10/20/75	T,I	350	Temp 9°C
8Q1	Frank Linden	1640	367	8	148	Fractured Basalt & Interbedded Sediments	28.67	10/27/75	T,I	300	Temp 9°C

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface		Use	Yield (gpm)	Remarks
							Feet	Date			
9E1	Luke Enyeart	1645	123	6			22.91	10/29/75	D		
9E2	Luke Enyeart	1660	131	6			37.86	10/18/65	U		
12D1	Gale Hiler	2000	295	6	19	Fractured Basalt	210	7/27/70	D	3	Temp 11°C
18D1	L. J. Eshelman	1590	68	8	68	Sand & Gravel	6	10/04/65	U	120	
18D2	L. J. Eshelman	1610	70	6	40	Sand	10	10/06/65	D	115	Temp 11°C
18D3	Calvin Linden	1600	983	16	339	Basalt & Interbedded Sediments	17.64	10/28/75	I	1500	Geophysical Logs
18Q1	L. M. Young	1640	115	6			71.57	10/28/75	D		
19D1	Frank Bromley	1650	85	6			65.58	10/18/65	D		Well depth approx.
20B1	Paul Dooley	1710	132	6			77.99	6/15/76	U		
29G1	R. E. Hornibrook	1600	375	8	8		35.00	8/28/76	U		Geophysical Logs
30F1	Clinton Cosner	1800	160	6	56	Interbedded Sediments	82.82	10/28/75	D	20	
					T. 3 N. R. 17 E.						
1A1	Wm. Claussen	2070	100	6			28.60	12/10/75	U		
2C1	Wm. Claussen	2042	55	6		Basalt	Flow	8/12/75	D	60	
2C2	Wm. Claussen	2040	35	36			4.4	8/12/75	U		
3A1	Davenport	2040	260	6	20		154.6	8/12/75	D		
4A1	Wm. Hoctor	1990	88	4			35	10/06/65	D		SWL from owner's memory
4A2	Wm. Hoctor	1980	287	6		Fractured Basalt	92.5	8/12/75	D	12	Temp 12°C
5B1	Emmett Hoctor	1925	130	10	80	Interbedded Sediments	65.15	10/29/75	I	500	
5C1	Emmett Hoctor	1910	69	8	28		15.80	10/06/65	D	35	
5P1	Emmett Hoctor	1960	186	12	52	Fractured & Vesicular Basalt	93.90	8/13/75	U	125	
6D1	C. R. Dowell	1870	110	6		Sand	7.10	8/13/75	D		

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
9B1	Wm. Hoctor	2580	112	6	103	Vesicular Basalt & Interbedded Sediments	80	11/19/69	D	35	Temp 11°C
12P1	Spokane, Portland & Seattle RR	400	325	12	145	Fractured Basalt	148	6/15/66	N	85	Temp 16.5°C
15L1	Ray Ferguson	400	42	6	40	Sand and Gravel	25	7/01/68	D	6	Temp 13.5°C
20K1	Martin Marietta	460	1128	20	30	Fractured & Vesicular Basalt	228	4/08/71	N	1000	
20L1	Walter Thompson	450	125	8	45	Sand	16.20	10/22/65	C	55	
21A1	Martin Marietta	520	504	10	23	Fractured & Vesicular Basalt	243	4/28/71	U		
21C1	Martin Marietta	500	1000	20	550	Fractured & Vesicular Basalt	270	9/08/71	N	840	Temp 16.5°C
28R1	U.S. Corps of Engineers	185					50.3	8/13/75	P		
29A1	U.S Corps of Engineers	247	769	16	301	Vesicular Basalt	121	10/22/65	N	550	Temp 18°C
					T. 3 N. R. 18 E.						
6D1	Yeley	2090	121.5	8			7.5	8/13/75	D		
9N1	Leland Huot	440	116	8	109	Vesicular Basalt	14	5/09/64	D,I	40	Temp 15.5°C
					T. 3 N. R. 19 E.						
2A1	C. D. Kelley	1100	310	6					U		
2A2	C. D. Kelley	1100	30	6	25	Fractured Basalt	11	11/16/72	D	45	Temp 11°C
7G1	Bob Imrie	1435	298	6			245.6	7/21/76	U		
8E1	F. Wesley	1350	300	6			260	8/06/75	D	9	SWL approx.

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Water Level Below Land Surface Date	Use	Yield (gpm)	Remarks
8N1	Alice Wesley	1260	223	6	20	Fractured Basalt	205.7	8/06/75	D	7	Deepened from 195' Temp 12^{o}C
13R1	J. Beeks	1047	180	6			147.8	8/07/75	D		
14H1	L. Goddard	1240	350	6			283.5	7/02/76	U		
18C1	Bob Imrie	1255	214.4	6			91	8/06/75	D,S	7	
18C2	Bob Imrie	1270	190				150	8/06/75	D		SWL from owner's memory
18L1	N. Doff	1242	115	48			110	8/06/75	D	3	
18Q1	Bob Imrie	1120	180				35.2	8/06/75	S		
23J1	Joe Horrigan	1018	140	6			126.7	7/21/76	U		
29B1	U.S Corps of Engineers	280	285	8	279	Vesicular Basalt	15.3	11/19/74	P	820	Temp 17^{o}C
					T. 3 N. R. 20 E.						
7F1	Horace White	830	265	10	39	Vesicular Basalt & Interbedded Sediments	28.3	9/16/75	U	250	
10P1	Juris	667	100				3.5	8/07/75	U		
13R1	D. Beeks	405	260	6			167.6	9/13/76	U		
21P1	Sundale Orchard Inc.	310	215	8	46	Fractured Basalt	87	8/24/52	I	100	
21Q1	Sundale Orchard Inc.	360	90	6		Fractured Basalt	87	8/24/52	I	100	
21Q2	Sundale Orchard Inc.	307	272	12	70	Fractured & Vesicular Basalt	110	5/01/64	I	900	Temp 14.5^{o}C
24H1	D. Beeks	990	260	6	60	Gravel	168.5	8/15/75	U		
					T. 3 N. R. 21 E.						
9L1	U.S. Corps of Engineers	280	191.5	14	65	Vesicular Basalt	101	4/04/66	P	92	Temp 16.5^{o}C
9N1	North Roosevelt Water Association	280	81	8	24	Vesicular Basalt	55	6/20/61	M	100	Temp 16^{o}C

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Water Level Below Land Surface Date	Use	Yield (gpm)	Remarks
9N2	North Roosevelt Water Association	280	88	8	22.5	Vesicular Basalt	67	5/10/61	M	98	
17F1	City of Roosevelt	350	223	6.5	50	Fractured Basalt	170	10/30/61	M	175	Temp 18.5°C Cascading Water
18J1	Norm Goree	370	250	6	64	Vesicular Basalt	140	11/07/72	I	60	Deepened from 186'
					T. 4 N. R. 10 E.						
11A1	Orlis Hale	900	137	6	137	Fractured Basalt	82	9/16/67	I		
11A2	Paul Newton	980	160	6	40	Vesicular Basalt	88	00/00/73	D	25	
11H1	Jess Moon	716	145	6		Vesicular Basalt			D		
11H2	E. W. Krall	700	72	6	70	Basalt	32	5/20/47	D	20	
11H3	J. R. Verley	700	130	6	115	Fractured Basalt	94	10/03/73	D	3	
11J1	F. L. Baugher	680	125	6	60		43	8/01/68	D	15	
12M1	Carl Belding	690	105	6	105	Vesicular Basalt	79	5/05/69	D	24	
12N1	Unknown	930	65	6		Vesicular Basalt			D	12	
13D1	L. Gribner	940	100	6			25.1	10/11/75	D		
13D2	L. Gribner	940	85	6		Vesicular Basalt	45	9/13/75	D		
13F1	Jay Robbins	940	85	6	35	Vesicular Basalt	30	6/16/70	D		
13G1	Eugene C. Morris	600	85	6	37	Vesicular Basalt	43	7/15/71	D	18	
13H1	Cora Rayburn	520	103	6	96		53	8/21/64	D	30	
13K1	Lawrence Ashley	590	84	6	84	Basalt and Sediments	44	7/20/72	D	10	
13Q1	Arthur F. Moore	580	81	6	39	Fractured Basalt & Sand	35	8/24/48	D	20	

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Water Level Below Land Surface Date	Use	Yield (gpm)	Remarks
13Q2	Arthur F. Moore	580	255	6	188	Interbedded Sediments	Flow	10/15/56	D	Flowing at 30 gpm	17 psi Temp 17°C
13Q3	B. A. Knapp	580	81	6	81	Fractured Basalt	44	7/18/72	D	30	
13Q4	L. M. Ashley	580	104	6	99	Fractured Basalt & Gravel	53	5/15/74	D	20	
24J1	Bob Jarvis	540	80	6			21.2	8/18/76	U		
24J2	Bob Jarvis	540	93	6	81	Sediments	16.3	2/12/76	U	30	
24R1	H. Barker	520	90	6	82	Vesicular Basalt	12	10/11/75	D		
25H1	A. W. Fredrick	440	95	6		Vesicular Basalt	28	7/27/72	D	40	Deepened from 78'
25H2	L. Duhrkop	440	90				34.7	10/07/75	D		
25H3	G. Hendryx	440	91			Vesicular Basalt	32.05	8/07/75	D		Iron in water
25H4	Claude Black	440	80	6	54	Fractured Basalt	61	10/05/73	D	10	
25J1	M. Reeves	485	110	6		Vesicular Basalt	33.7	10/07/75	D		Water high in iron at 50'
36E1	McCoy-Holliston Ins.	400	60	6	55	Fractured Basalt	16	10/07/73	D	20	
36E2	Stuart Fraser	400	120	6	96	Fractured Basalt	61	10/04/73	D	12	
36G1	David Gibney	480	120	6	113	Gravel	58	5/28/73	D	15	
36J1	Leo Gauvin	580	140	6	80	Fractured Basalt	60	11/24/73	D	12	Temp 10°C
36N1	Clem Clark	450	75	6	40	Fractured Basalt	35	10/03/73	D	12	
					T. 4 N. R. 11 E.						
5E1	K. W. Riggleman	1400	185	8	180	Sand and Clay	80	8/13/62	D,I	10	
6P1	E. L. Jones	1320	158	8	20	Sediments			I	1	
8J1	3 JB Ranch	2000	280	6	28		260	12/08/73	D	12	

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
19J1	J. S. Paradis	840	440	6	119	Fractured Basalt	225	5/26/74	D	17	
23P1	Leland Wiley	2020	83	6	59		40	8/18/74	D	10	
24L1	Kevin Smith	2200	285	6	32						No water
24L2	Pacific Bank Mortgage Company	2200	365	6	18	Vesicular Basalt	135	5/26/75	D	4	
24L3	John Bridges	2200	265	6	18	Vesicular Basalt	155	5/31/75	D	30	
30F1	Anderson	720	314	6			230	1975	D		
31E1	Husum Golf Course	500	162	6	144	Clay and Gravel	73.4	10/08/75	D,I	40	
34K1	F. Dunn	1840	260				14.4	5/26/75			
34K2	F. Dunn	1840	25			Alluvium	15	5/26/75			
					T. 4 N. R. 12 E.						
10G1	Gerald Darby	2400	80	6	18	Fractured Basalt	40	9/13/74	D	50	
10J1	F. B. Augee	2420	300	6	20	Fractured Basalt	20	9/22/74	D	5	
10L1	William Parnett	2420	100	6	100	Sandy Clay	25	9/16/74	D	20	
10P1	Cook	2460	260	6	70	Fractured Basalt	60	9/30/74	D	13	
10P2	Rodney Augee	2480	145	6	76	Fractured Basalt	68	8/01/72	D	8	Temp 12°C
10Q1	W. A. Hartley	2440	250	6	33				U		No water
10R1	Lawrence Milgrove	2420	410	6	18	Fractured Basalt	300	9/11/74	D	1	
10R2	Lawrence Milgrove	2420	100	6	19				D		Temporarily abandoned: no water
11G1	Bill Suckow	2260	100	6	100	Sand	22	9/20/74	D	12	
11N1	United Homes Corp.	2400	265	6	30	Vesicular Basalt	12	6/15/70	D	20	Temp 11°C

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
15A1	Al Boni	2420	85	6	24	Fractured Basalt	11	6/18/73	D	6	Temp 11°C
15C1	Frank Adams	2520	285	6	19	Vesicular Basalt	74	7/20/73	D	60	Temp 11°C
15D1	Art Morris	2520	175	6	41	Vesicular & Fractured Basalt	40	8/01/73	I	1	Temp 12°C
15E1	Frank Reiber	2540	55	6	23		16	6/11/73	D	12	Temp 11°C
15F1	Dale Van Horn	2530	180	6	46		16	6/18/73	D	1	Temp 12°C
15R1	Delbert Blackburn	2520	85	6	19	Fractured Basalt	40	7/26/72	D	25	Temp 12°C
21Q1	Lolla Loftis	2560	205	6	62	Basalt	132	6/02/75	D	3	
22R1	Willis H. Maxson	2440	80	6	69	Fractured Basalt	20	10/02/74	D	25	
23C1	Appleton Post Office	2335	28	5	28				D	20	
23C2	Appleton Post Office	2335	75	6	50				D		
23P1	Mel Tennison	2330	75	6	29	Vesicular Basalt	54	7/30/71	D	10	
24P1	Edward Fousel	2300	260	6	56				U		No water
26H1	Gail Lane	2300	75			Alluvium	3	7/17/54	D	60	Infiltration trench 6' long
					T. 4 N. R. 13 E.						
12A1	Steven Drew	1800	230	6	40	Sand and Clay	22	8/10/72	D	3	Temp 12°C
12C1	Lyle Long	1800	180	6	18	Fractured Basalt	97	8/09/72	D	20	Temp 11°C
22P1	H. L. Vogt	450	96	6	49	Fractured Basalt & Gravel	12.3	6/13/75	D		
22Q1	Unknown	460	374	6	20	Vesicular Basalt	5	8/23/70	D,I	100	
23E1	St. Regis Paper Co.	475	550				Flow	10/21/64	U	80	
24H1	Wash. Dept. of Natural Res.	520	295	8	55		Flow	3/22/66	U	90	

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
28G1	Kenith Vogt	440	133	6	82		60	10/15/64	D,I	50	
28G2	J. McGaughey	440	89	6	70				D		
28J1	R. A. Petre	420	46	6	21		Flow	4/14/66	D,I	60	Flowing at 10 gpm
32C1	L. A. Barrett	380	24				9.60	6/28/75	D		
32C2	L. A. Barrett	380	25				8.75	6/28/75	I		
32F1	D. W. Riggle	380	37	6	20				D		
					T. 4 N. R. 14 E.						
1A1	Unknown	1640	180	4			27.41	10/13/65	U		
1M1	Ken Sipe	1530	565	6	155	Vesicular Basalt	430	6/27/72	D	25	Temp 16.5°C
17F1	W. F. Kirchner	590	60	6	23	Fractured Basalt	Flow	7/12/69	D	5	Flows 1 psi Temp 11°C
21C1	Leroy Van Belle	1360	955	6	74		660	8/18/76	U		Deepened from 372' Geophysical Logs
21D1	Leroy Van Belle	1360	115	6					U		No water
23L1	Wash. Investment	1580	310	6	5				U		
26K1	Raymond Humphrey	1560	195	6	138	Vesicular Basalt	124.5	4/29/74	D	60	
					T. 4 N. R. 15 E.						
1F1	C. E. Mesecher	1815	186	6			120.3	10/28/75	D		
1K1	Guy E. Moore	1790	120						D		Temp 11°C
1Q1	Eugene H. Amidon	1750	130	8	80	Vesicular Basalt	55	6/11/70	I	200	Temp 12°C
2F1	Unknown	1760	43	6			24.25	10/28/75	U		
2J1	C. J. Butts	1790	160	6			111.56	10/28/75	D		
2L1	Al Shupe	1720	6			Alluvium	0.00	10/28/75	D		Sump
2N1	E. E. Clouse	1685	60	8			2.46	10/11/65	D		Temp 11°C
2N2	E. E. Clouse	1680	410	6	66	Fractured Basalt	45.68	10/28/75	D,I	150	Temp 10°C
3H1	A. Winterstein	1725	415	14	133	Vesicular Basalt	71.70	10/28/75	D,I	700	

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
4F1	Ed Doubravsky	1760	130	6	19	Vesicular Basalt	65	4/24/73	D	8	Temp 10°C
4N1	Hermon Schultz	1680	115	6	65		26	11/04/71	D	12	Temp 12°C
4P1	Unknown	1670	63	8			41.92	10/13/65	U		
4P2	Phillip M. Riches	1665	307	6	80	Fractured & Vesicular Basalt	45	7/28/67	D,I	60	
4P3	Hermon Schultz	1670	445	6	87	Interbedded Gravel	31	9/03/74	I	100	Temp 12°C
4R1	George Andrews	1680	130	6	19	Vesicular Basalt	39.54	10/28/75	D	17	Temp 12°C
5A1	Dale Thiele	1700	277	8	39	Fractured Basalt	19	3/15/69	D		
5A2	Clifford Collins	1690	280	6	113	Vesicular Basalt	54.06	10/28/75	D,I	20	
5E1	Ed Cuff	1675	220	6	34		2.05	6/16/75	D	4	Temp 12°C
5J1	Dale Thiele	1710	382	8	58	Vesicular Basalt & Interbedded Sediments	47	10/05/67	D,I	30	
5L1	Ronald Alexander	1660	117	6			43.51	10/28/75	D		Temp 13.5°C
6A1	Howard Bratton	1680	595	8		Sandy Silt	31	11/22/74	I	200	Deepened from 209' Temp 12°C
8C1	Earl McClintock	1660	460	6	26		94.83	10/24/75	D	12	
8G1	Earl McClintock	1650	355	6	15		44.00	11/00/69	D		
8R1	Unknown	1590	80	6			5.11	10/28/75	U		
9C1	Ray Hill	1660	115	10	50	Sand & Clay Interbed	11.91	10/27/75	I	100	Temp 12°C
9D1	Ken Hill	1680	115	6	35		14	9/20/74	D	25	Temp 12°C
9F1	Ray Hill	1630	91	8			0.26	4/15/75	D		Temp 13.5°C
9G1	Ray Hill	1620	145	6	27	Vesicular Basalt & Sediments	6	9/19/74	D	45	Temp 12°C
10A1	John Ihrig	1690	160	6	19	Vesicular Basalt & Sand			D	5	

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
10F1	George Beebe	1660	450	10	383	Fractured Basalt	27.96	10/28/75	I	450	
10K1	Robert E. Ruff	1650	142	6	72	Interbedded Sediments	15.13	10/28/75	D,I	300	Temp 10°C
10K2	Edward L. Uecker	1650	145	6	42	Interbedded Sediments	23.05	10/28/75	D	20	Temp 12°C
11K1	Wash. Dept. of Game	1640	335	6	184	Vesicular Basalt	Flow	10/28/75	D	30	Flows at 4 gpm Temp 12°C
12B1	E. H. Amidon	1760	105	6			62.07	10/27/75	D		Temp 10°C
12C1	Ray Hill	1750	147	6			68.14	10/27/75	U		
12F1	Ray Hill	1700	78	7			36.24	10/29/75	U		
12R1	Bert Knox	1670	120	6			17.64	10/27/75	D		
13C1	Harold Hill	1685	320	6	20		66.93	10/27/75	D	10	Temp 13.5°C
13K1	Claude Knight	1645	91	6			12.00	10/27/75	D		Temp 11°C
13K2	Claude Knight	1645	520	8			24.64	10/29/75	U		Temp 10°C
14Q1	Ray Hill	1635	128	6	128	Interbedded Sediments	79.75	10/27/75	D	9	Temp 12°C
14R1	Ray Hill	1630	125	6			79.43	10/27/75	U		
15H1	Griselda Hill	1620	65	8			40	00/00/65	D		
15H2	Ross Wilkins	1630	295	6	76	Vesicular Basalt & Sediments	106	11/06/71	P	12	
16F1	Wash. Dept. of Natural Res.	1595	595	12	331	Fractured Basalt & Clay	203.00	10/14/75	T	450	Geophysical Logs Has piezometer tubes -- SWL is for zone D (500 580') Temp 16°C
21F1	Lloyd Hutchins	1600	232	6	27		74.03	10/29/75	D	4	
21K1	R. M. Divers	1525	102	6	35		39.18	10/29/75	D		
22Q1	Tom Esteb	1460	219	8			13.50	4/15/75	U		
23D1	B. F. Dunn	1610	80	6					D		
23D2	Gordon Rose	1620	197	6	190	Sand and Gravel	121	8/18/72	D	50	Temp 11°C

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface		Use	Yield (gpm)	Remarks
							Feet	Date			
23E1	B. F. Dunn	1620	190	6	10	Fractured Basalt & Sand	103.17	4/15/75	D,I	800	
23E2	B. F. Dunn	1610	190	10	16	Basalt and Sand	173.35	10/29/75	D,I	250	
23P1	J. B. Fletcher	1480	40	6					D		
25A1	Ray Shull	1520	86	6			13.24	10/04/65	U		Temp 11°C
26A1	R. M. Largent	1490		6			Flow	10/29/75	D		Temp 11°C
26B1	Inez Holdridge	1510	295	6	52	Vesicular & Fractured Basalt	62.35	10/29/75	D	2	Temp 12°C
26H1	George Keech	1580	300	6	35	Fractured Basalt	11.49	10/29/75	I	60	
26P1	J. B. Fletcher	1680	85	6	63	Vesicular Basalt & Sediments	42	4/19/73	D	6	Temp 12°C
26R1	S. H. Lester	1650	40				3.28	4/14/75	D		
26R2	George Keech	1660	125	8	117	Sand and Gravel	43.13	10/24/75	I	270	
27F1	Leo Moore	1560	434	6	30		39	8/28/76	U		Geophysical Logs
27J1	Skip Corsey	1620	205	6	57	Fractured Basalt	40	5/28/74	D	10	Temp 11°C
27R1	Blake L. Bishop	1680	205	6	39	Vesicular Basalt	36	6/13/74	T	60	Temp 12°C
27R2	Jack Kent	1680	115	6	34	Fractured Basalt	22	6/11/74	D	15	Temp 11°C
28P1	Al Shupe	1640	158	6			93.79	10/28/75	D		
31D1	Ken Anderson	1760	430	6	81	Vesicular Basalt	130.00	1/24/74	D	50	Temp 12°C
32R1	M. H. Eshleman	1810	256	6					D	5	
32R2	Charles Eshlemen	1800	250	6	52	Fractured Basalt	144.65	10/27/75	D	3	Temp 11°C
34D1	Earl McClintock	1680	100	6	38	Fractured Basalt	23	6/07/74	S	7	Temp 12°C
35E1	Earl McClintock	1740	115	6	73	Fractured Basalt	60	7/23/73	D	10	Temp 12°C

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
					T. 4 N. R. 16 E.						
1K1	Dale Wirrick	1870	100	6	19	Sand Interbed	27.89	10/28/75	D	30	Temp 11°C
1L1	Dick Atkins	1840	100	6	19	Fractured Basalt	18.83	10/28/75	D	20	
2L1	C. G. McLary	1780	60	6			Flow	10/14/65	D		Temp 12°C
2N1	Lewis Walter	1765	120	6			Flow	10/04/65	D		
3L1	Louise Billy	1940	319	6	293	Interbedded Sediments	181.80	10/12/65	D	70	
3R1	Carol Barker	1740	101	6			0.00	10/14/65	U		
5K1	E. D. Brokaw	1920	220	5			148.05	10/13/65	U		
6A1	Roger Pond	1920	340	6	34	Vesicular Basalt	235	7/02/73	D	12	Temp 12°C
6H1	R. W. Smith	1820	360	6			169.75	10/29/75	U		Temp 11°C
6M1	Harry Mesecher	1820							D		
8G1	Pat McEwen	1800	300	6	28	Vesicular Basalt	117	8/06/69	D	50	Temp 11°C
9D1	E. M. Foster	1820	200	6	19	Vesicular Basalt	53	9/24/74	T	3	Temp 12°C
10A1	Unknown	1750	178	6	42		5.19	8/21/57	U		
10A2	Rick Gables	1740	250	6	40	Vesicular Basalt	Flow	10/28/75	D		Well deepened from 125' Artesian pres. 40 psi. Temp 12°C
10B1	R. H. Sellars	1710	110	8	110		15	8/00/59	D	35	Temp 12°C
10B2	M. Firch	1730	265	6	60	Vesicular Basalt	Flow	10/28/75	D	45	Artesian pres. 35 psi deepened from 115' Temp 13.5° C
10B3	Dick Ladiges	1800	415	6	23	Vesicular Basalt	40	7/13/72	D	12	
10F1	Guy Shrader	1720	275	6	70	Vesicular Basalt	Flow	10/28/75	D,I	45	12 gpm flowing

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface		Use	Yield (gpm)	Remarks
							Feet	Date			
10L1	Charles Koenig	1700	115	6	19	Fractured & Vesicular Basalt	20	5/27/71	D	3	Temp 11°C
10N1	Jack Rose	1670	240	6	40	Fractured Basalt	15.19	10/28/75	D	40	Temp 11°C
11D1	C. M. Barrett	1800	15	30	15	Sand and Gravel	4	10/28/75	D		
11D2	C. M. Barrett	1880	420	6	26	Vesicular Basalt & Interbedded Sediments	Flow	4/07/70	I	65	Artesian pres. 2 psi Temp 11°C
11D3	C. M. Barrett	1900	625	10	57	Fractured Basalt	Flow	12/06/75	I	1400	Artesian pres. 45 psi Temp 19°C Geophysical Logs
11J1	Dale Reimer	2140	370	6	29				U		No water Geophysical Logs
11M1	C. M. Barrett	1940	245	6			180.31	10/23/65	D		
14G1	M. H. Norris	1790	142	8	20		43.35	10/28/75	I	50	
14L1	M. H. Norris	1760	85	6	41	Vesicular Basalt	18.40	10/28/75	I	60	
14N1	H. L. Norris	1840	500	8			375	10/05/65	D		
14P1	H. L. Norris	1810	120	6			110	10/05/65	U		Temp 13.5°C
15E1	Wash. State Patrol	1680	100	6	34	Vesicular Basalt	5.39	10/28/75	D	6	Temp 11°C
15L1	Maxine Knosher	1680	120	10	15	Vesicular Basalt	Flow	11/14/69	I	60	Artesian pres. 2 psi. Temp 11°C
15N1	Maxine Knosher	1680	105	6	18	Vesicular Basalt	1.96	10/28/75	T	75	Flowed at 30 gpm when drilled-now flows intermittently Temp 10° C
15N2	Seventh Day Adventist Church	1680	115	6	20	Vesicular Basalt & Clay	41.00	9/23/74	D	45	Temp 11°C

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Water Level Below Land Surface Date	Use	Yield (gpm)	Remarks
16J1	R. L. Hall	1640	78	6			15.24	10/14/65	U		
16K1	Ed Doubravsky	1580	205	10	18	Gravel Interbed	7	6/05/69	T	100	Temp 12°C
16L1	Ort Olson	1680	337	6	34	Interbedded Sediments	134	9/27/76	U		Geophysical Logs
16L2	Don Williams	1580	115	6	25	Fractured Basalt & Clay	38	4/28/72	D	60	
16Q1	Fred Stone	1640	40	8	29		12	5/06/69	T	60	Temp 12°C
16Q2	City of Goldendale	1640	880	16	100	Vesicular Basalt	0.00	9/29/76	U		Geophysical Logs Temp 16-26°C
16R1	D. B. Ledbetter	1660	130	6	24	Vesicular Basalt	20	8/06/71	T	30	Temp 12°C
17A1	W. C. Dashiell	1700	115	6	91		59	6/07/73	D	60	Temp 12°C
17C1	Jim Lefever	1650	127	8	115	Interbedded Sediments			I	400	
17G1	Neil Thompson	1620	175	6	120	Interbedded Sediments	45.73	10/29/75	D,I	40	
17H1	Dennis Templer	1680	305	6	18		110	8/29/76	U		Geophysical Logs
17R1	G. J. Timmer	1620	155	5	60	Interbedded Sediments	Flow	00/00/65	D	50	
17R2	H. W. Freer	1620	180	6	25	Interbedded Sediments	4	8/22/70	D	60	
18A1	Amos Bonjour	1660	140	6			21.24	10/07/65	D		Temp 12°C
18P1	O'Leary Well Drilling, Inc.	1620	320	6	35	Vesicular Basalt & Clay	58	11/10/71	C	60	Temp 12°C
19R1	J. H. Willis	1600	50	10			2.05	10/29/75	D		Flows inter-mittently Temp 12°C
19R2	Holy Trinity Church	1600	90	6	18	Vesicular Basalt	Flow	4/15/75	I		Flows inter-mittently Temp 12°C
20A1	Klickitat County	1620	200	8	43		6	3/10/46	I		Temp 12°C

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Water Level Below Land Surface Date	Use	Yield (gpm)	Remarks
20D1	Ed Layman, Inc.	1620	235	6	77	Vesicular Basalt	48	7/24/74	C	60	Temp 12^{o}C
20F1	Bert Wilkins	1560	52	6	20	Gravel Interbed			I	90	
20F2	J. P. Stockhouse	1590	145	8	20	Vesicular Basalt & Clay	25.27	10/25/75	I	60	Deepened from 104' Temp 12^{o}C
20G1	Boise Cascade	1610	115	6			8.50	9/13/76	U		
20G2	Bert Wilkins	1610	400	6	25		2	4/29/69	T	50	
20G3	Harry Moore	1610	190	6	20		25	8/23/70	D	5	Temp 11^{o}C
20H1	Eldon Kerns	1620	84	6	18		1	6/01/74	D	10	Temp 12^{o}C
20K1	Boise Cascade	1610	337	6	26	Interbedded Sediments	23	8/18/66	I	75	
20K2	Buel Bane	1620	120	6	31	Interbedded Sediments	30	7/06/68	D	15	
20M1	C. L. Storkel	1560	88	8	13	Vesicular Basalt	Flow	10/30/75	D,I	90	Flows inter-mittently Temp 12^{o}C
21A1	Unknown	1690	97	6			27.82	10/06/65	U		
21B1	Johnny Foster	1660	115	8	80		29.45	11/18/75	U	300	
21B2	D. Wedgewood	1650	490	6	19		25	8/30/76	T	400	Geophysical Logs
21B3	George Shockley	1650	115	6	19		39	5/31/74	D	60	Temp 12^{o}C
21F1	Goldendale School System	1660	102	8	26	Vesicular Basalt	18	11/15/69	I	150	Deepened from 90'
21K1	C. L. Mesecher	1690	311	8	63	Fractured Basalt			I		Deepened from 205' Original SWL 40'
21Q1	John Hoctor	1690	105	8	25	Vesicular & Fractured Basalt	30	3/31/70	D	75	
22G1	Al Bauer	1720	444	6	35		34	8/27/76	U		Geophysical Logs
22J1	Gorge Contractors, Inc.	1760	397	6	18		390	8/09/68	I		
22L1	Bert Wilkins	1750	170	8	45	Vesicular Basalt	76.41	10/29/75	I	300	Temp 11^{o}C

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
22L2	Bert Wilkins	1760	70	10	20		Flow	10/29/75	I	600	Flows intermittently Temp 11°C
22N1	Dwight Dingmon	1740	675	6	40		105	8/19/76	U		Geophysical Logs
22P1	Al Bauer	1820	424	8	37	Vesicular Basalt	170	8/27/76	I	100	Temp 11°C
22Q1	Bert Wilkins	1760	300	8	50		61.42	10/29/75	I	350	Temp 11°C
23A1	H. L. Norris	1855	220	8			21.60	10/28/75	S		
26C1	G. W. Willis	1830	247	6	12	Vesicular Basalt	63.03	10/28/75	D,I		Deepened from 47'
26C2	G. W. Willis	1830	85	6			36.26	10/28/75	U		
26C3	G. W. Willis	1830	179	6			40.61	10/28/75	U		
26K1	Eleanor Dooley	1840	142	6		Fractured Basalt	5	4/15/68		12	
26Q1	Eleanor Dooley	1840	202	6		Basalt	20		S	2	
27A1	W. P. Cunningham	1790	46	6		Sand Interbedded	29		D	60	Temp 14.5°C
27E1	Rex Maurer	1760	217	6	20		80	10/10/68	D	4	Temp 11°C
27E2	Rex Maurer	1760	112	6			40	11/11/68	D	8	Temp 11°C
28A1	Dwight Dingmon	1715	130	6	5.5	Fractured Basalt	10	4/25/68	D	18	
28A2	Dwight Dingmon	1720	300	6	12	Vesicular Basalt			I	100	
28A3	Dwight Dingmon	1720	531	10	32		102	10/24/68	D,I	600	Deepened from 307' Geophysical Logs
28D1	Rex Maurer	1700	87	6	30	Vesicular Basalt	21.68	10/29/75	D	60	Well deepened from 65'
28E1	John Benson	1700	88	6	88		67.56	10/29/75	D		
28G1	Grant Gibbs	1720	115	6	38	Vesicular Basalt	30	5/30/74	D	60	Temp 12°C
28H1	Rex Maurer	1740	580	6	177		203.52	10/30/75	D	17	
28K1	Luke Enyeart	1760	105	6	52	Clay	30	9/23/68	D,I	80	
28M1	C. E. Herin	1760	460	6	19	Vesicular Basalt	75	5/27/70	D,I	50	Temp 11°C

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Water Level Below Land Surface Date	Use	Yield (gpm)	Remarks
29B1	R. E. Hornibrook	1640	85	6	9	Vesicular Basalt	46.33	8/30/65	U	25	
29B2	R. E. Hornibrook	1640	100	6	13	Vesicular Basalt	28.00	10/29/75	D	50	Temp 10°C
29G1	R. E. Hornibrook	1660	85	6	12		41.40	10/28/75	I	55	
29G2	R. E. Hornibrook	1660	86	6	10	Fractured Basalt	36.63	10/28/75	I	52	
29G3	R. E. Hornibrook	1660	382	8	13		120	4/11/68	D,I	5	Well deepened from 100' -- cascading water Temp 10°C
29H1	R. E. Hornibrook	1700	112	6	12	Fractured Basalt & Sand	77.35	10/24/75	D,I		
29H2	R. E. Hornibrook	1700	130	8	20	Fractured Basalt	77.12	10/28/75	D,I	75	Temp 11°C
29J1	R. E. Hornibrook	1720	118	6			56.45	10/28/75	U	20	Temp 12°C
30A1	Holy Trinity Church	1600	267	6	40	Fractured Basalt	91.78	4/30/74	I	10	Deepened from 167' Temp 12°C
30F1	Ross Crafton	1560	49	6			Flow	10/29/75	D		Flowing at 5 gpm Temp 11°C
31G1	Norman Dingmon	1650	115	6	43	Vesicular Basalt & Interbedded Sediments	60	5/04/72	D	45	
31Q1	Ray Shull	1650		6			117.67	10/29/75	D		Deepened from 75' to unknown depth
32A1	C. R. Blanchard	1715	102	6	20	Vesicular Basalt	33.55	10/28/75	D,I	60	Temp 11°C
32N1	Glen Seward	1680	130	6	19	Interbedded Sediments	30	1/28/75	D	20	Temp 11°C
33D1	W. F. Hornibrook	1730	57	6			42.63	4/16/75	D	70	
33E1	Howard Smith	1720	115	6	23	Vesicular Basalt			D	10	Deepened from 55'
33G1	W. F. Hornibrook	1790	240	8			83.21	10/21/65	U		

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
33G2	W. F. Hornibrook	1790	130	6			104.59	10/21/65	D		
34H1	Marvin H. Norris	1840	500	6	102	Vesicular Basalt	53.99	10/29/75	I	450	Geophysical Logs Deepened from 112' Temp 18°C
34H2	Marvin H. Norris	1800	247	8	18	Basalt & Interbedded Sediments			I	300	
35K1	Tom Ested	1840	142	6	18		5	4/15/68	D	12	Temp 11°C
35L1	Tom Ested	1880	202	6	26	Fractured Basalt	20	4/20/68	D	2	Temp 11°C
35R1	Unknown	1870		5			58.42	6/25/64	U		
36R1	Don Mains	1870	210	6	20	Vesicular Basalt	40	6/01/73	D		
36R2	Don Mains	1870	145	6	40	Fractured Basalt	36.80	8/13/75	D		
						T. 4 N. R. 17E.					
2P1	Eleanor Dooley	2180	308	6	5	Basalt	57	9/29/69	S	1	
4E1	Trans West Company	2220	55	6	18	Interbedded Sand	0.04	10/27/75	D	5	Temp 12°C
7D1	L. E. Schroder	2260	385	6	20	Interbedded Gravel	380	8/24/76	D	25	Geophysical Logs
9F1	O'Leary Well Drilling	2410	355	6	131	Fractured Basalt	215	11/15/74	U	25	
9H1	L. Osbornson	2240	21	6			13.70	8/13/75	D		
9L1	O'Leary Well Drilling	2260	554	6			234.00	5/09/75		85	
9P1	O'Leary Well Drilling	2220	550	6			16.70	5/29/76	U		Hole plugged, SWL probably not indicative of true head
10N1	J. Schuster	2160	230	8			158.60	10/05/65			No water
12L1	Boehler	1965	176	6			29.20	8/12/75	D		
12M1	Art Schuster	1900	220	6			44.20	8/12/75	U	2	
12M2	Art Schuster	1980	445	8			188.10	10/06/65	D	35	Temp 14.5°C
15D1	J. Schuster	2150	69	6			55.88	10/05/65	U		

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
15D2	J. Schuster	2150	103	8			75	10/05/65	D		Temp 13.5°C
16G1	G. Trumbo	2155	118				59	1948	D,S		
16G2	G. Trumbo	2145	203	6			53.35	8/12/75	D		
16H1	G. Trumbo	2140	50	6			9.00	8/12/75	U		Well reported to be 270' deep. May have caved.
18G1	Ronald Roe	2120	125	6	30		99.17	10/27/75	D	3	Temp 11°C
18R1	C. Fridley	2080	305	6	20	Gravel			S	3	SWL reported to be 150'
19F1	C. Fridley	2040	150	4	25				D	3	SWL reported to be 100'
19G1	C. Fridley	2020	115	6	20				S	6	SWL reported to be 75'
19G2	C. Fridley	2050	251	6	47	Fractured Basalt	116.50	8/13/75	I,D	200	Water level obtained while well was being pumped. SWL was reported to be 49'
21J1	Cecil Schuster	2000	250	6			35	8/29/76	U		Geophysical logs
22N1	Fenton Brothers	2000	41	6	41	Vesicular Basalt	25	10/00/65		30	
22N2	D. Myra	1995	150	6			37.10	8/13/75	D		
22N3	J. Schuster	1990		6			22.60	10/14/75	D		
22Q1	D. Myra	1910	6				0.50	10/14/75	U		
28H1	J. Schuster	1935	500	8			65.90	10/14/75	U		
28R1	Unknown	1960	53	6			9.61	10/23/65	U		
29P1	Sheryl Willis	1960	538	10	78	Vesicular Basalt & Clay	91.85	10/28/75	I	700	
30A1	Wayne Hoctor	2010	430	6	100	Vesicular Basalt	95.00	8/13/75	D	20	Temp 11°C
30H1	R. Willis	1960	60	6			34.70	8/13/75	D	6	Pump on during water level measurement.

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Water Level Below Land Surface Date	Use	Yield (gpm)	Remarks
30J1	Sheryl Willis	1960	62	6	20	Vesicular Basalt	24.85	10/28/75	D	10	Temp 12°C
30R1	Sheryl Willis	1930	700	12	55	Fractured Basalt	280	8/07/72	I	700	
31L1	T. V. Wilkins	1880	139	16			4.62	9/18/75	U		
31M1	T. V. Wilkins	1865	177	6	18	Fractured Basalt & Clay	40	8/26/69	S	100	Temp 11°C
31N1	T. V. Wilkins	1870	20	48	20		9.40	8/12/75	U		
31N2	T. V. Wilkins	1870	100	6			52.10	8/12/75	D		
32D1	S. Willis	1933	550				34.37	4/16/75	I	300	
32J1	Cecil McDowell	1960	78	6			29.43	10/06/65	S		Temp 11°C
32P1	Emmett Hoctor	1920	228	8	40	Vesicular Basalt	36.37	4/16/75	I	300	Temp 11°C
					T. 4 N. R. 18 E.						
7R1	Cecil Schuster	1870	400	8			197.0	10/14/75	D		
8R1	J. Johnson	1839	120	6		Vesicular Basalt	94.0	9/08/75	D		Well originally drilled to 200'
17G1	Cecil Schuster	1640	150	10	116		126.9	10/14/75	I		
17K1	Cecil Schuster	1720	780	10	183		100.3	10/14/75	I	600	Deepened from 455' Temp 16.5°C
18R1	Wm. Anderson	1713	10				9.0	10/14/75	U		
18R2	Wm. Anderson	1713	70	8					D	4	
28M1	W. Jones	1690	45	6			40	10/14/75	D	40	SWL approximate
29G1	Raymond R. Brack	1680	277	10	138		98	9/22/68	I	500	
					T. 4 N. R. 20 E.						
3E1	Berk Bros. Inc.	2100	35	48	35	Alluvium	14.75	6/27/75	U		
3L1	Harland Berk	2205	274	12	182	Sand & Clay Interbed	205.25	6/27/75	I	1037	

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Water Level Below Land Surface Date	Use	Yield (gpm)	Remarks
4D1	Sam Berk	2274	335	6	35	Fractured Basalt	85.75	6/27/75	D	15	
6A1	Bob Powers	2270	200	6		Clay Inter-bedded	18.25	6/27/75	D	12	
6C1	Bob Powers	2250	130	6			25	3/13/71	D	5	
18Q1	Bert Wilkins	2440	253	6	19	Sand & Clay Interbed	130	10/03/69	T	10	
20Q1	Bob Powers	2180	175	6	119	Fractured Basalt	80.99	6/27/75	D	15	Temp 12°C
					T. 4 N. R. 21 E.						
9K1	Del Whitmore	1620	302	6		Clay Inter-bed			S		
					T. 4 N. R. 22 E.						
3N	Unknown	942	45	48		Alluvium	21.00	4/05/75	S		
7J1	Goodnight	1118	38	6			26.70	8/05/75	S		
12F1	C. E. McBride	1020	547	10	135				U		No water
					T. 5 N. R. 10 E.						
1Q1	Newhouse	1560	107	6	60		40	9/00/75	D	25	
6H1	Wash. Dept. of Natural Res. Well #1	2560	58	2	10	Interbedded Sediments	21.00	9/10/75	T		Geothermal Exploration Hole
12Q1	J. Anrig	1430	80	6		Vesicular Basalt			U	4	
35F1	Orlis Hale	960	155	6	150	Sand	104	3/22/73	D	20	
35K1	J. Wood	1240	200	6					D		
					T. 5 N. R. 11 E.						
1P1	Phillip Ohnemu	1865	51	6	51	Alluvium	18.27	4/01/74	D		
6F1	D. Duke	1605	115	8	10	Vesicular Basalt	90	9/04/74	D	20	
12E1	Conboy Refuge	1845	66	10			1.39	4/01/74	U		

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface: Feet	Water Level Below Land Surface: Date	Use	Yield (gpm)	Remarks
12E2	Conboy Refuge	1845	17	36	17	Alluvium	1.40	4/01/74	U		
12Q1	Conboy Refuge	1850	59			Alluvium	5	10/00/73	T		
31R1	Mt. Adams Orchard Company	1360	600	16	333		31	6/11/65	D,I	23	Unusable water from 11' to 39'
32N1	Hopp-DeWilde Mill Company	1360	75	8	23	Vesicular Basalt	25	9/10/47	C	36	
					T. 5 N. R. 12 E.						
3C1	Conboy Refuge	1860	57	36	7		11.18	7/19/74	U		
3C2	Conboy Refuge	1860	51	6			14.08	7/19/74	U		
4H1	Agnes Miller	1830	225	6	100	Basalt	215.00	1972	S	6	Temp 12°C
4H2	Agnes Miller	1830	19	72	19	Alluvium	10.16	7/17/74	D		
5Q1	Conboy Refuge	1830	118	6			22.79	4/30/74	U		
5Q2	Conboy Refuge	1830	8	36	8	Alluvium	3.15	4/30/74	U		
6Q1	Chip Kreps	1825	84	6			7.20	10/10/74	S		
14H1	Miller	1830	16	72	16	Alluvium	13.10	9/09/75	D		
18E1	Darrell Lee	1860	160	8	160	Alluvium	3.42	5/01/74	U	500	
18E2	Darrell Lee	1855	7	36	7	Alluvium	1.81	5/02/74	D		
					T. 5 N. R. 13 E.						
26D1	Don Roane	2330	130	6	49	Fractured Basalt	55	7/12/73	D	3	Temp 12°C
36L1	Donna Walters	2200	205	6	22		40	11/04/72	D	0.5	Deepened from 85' Temp 11°C
					T. 5 N. R. 14 E.						
6E1	St. Regis Paper Co.	1180	326	8	297	Fractured Basalt	256.0	6/30/75	N	50	
16L1	L. Boardman	1920	56	8			Flow	8/18/75	D		
21A1	Wash. Dept. of Game	1870	385	6	21	Fractured Basalt	228.4	10/29/75	D	156	Temp 12°C
22K1	Ralph McKinney	1830	190	6	90	Vesicular Basalt	105	12/05/70	D	10	Temp 11°C

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
24J1	Floyd Thompson	1980	182	6			137.70	10/30/75	D		Temp 12°C
26D1	Calvin Beeks	1760	125	6	36	Vesicular Basalt	80	7/12/74	D	5	Temp 12°C
26K1	George Williams	1700	160	6	29		26.50	11/19/74	D	5	
26L1	Victor Bryant	1720	250	6	19	Fractured Basalt	53.25	4/15/75	U		Temporarily abandoned
26L2	Victor Bryant	1720	182	6	132		40	10/09/73	D	7	Temp 11°C
36B1	Duane Van Patter	1720	400	6	55	Fractured Basalt	173	4/04/74	D,I	30	Temp 12°C
36B2	Duane Van Patter	1720	325	6	72	Fractured Basalt & Clay	115	5/07/75	D,I	60	Temp 12°C
36D1	Duane Van Patter	1720	250	6	20		188.29	5/06/75	D	35	Temp 12°C
36R1	Ted Richardson	1600	340	8	4	Interbedded Sediments	113.30	10/28/75	D	60	
					T. 5 N. R. 15 E.						
10K1	Fred Linton	2410	340	6	86	Vesicular Basalt	255	8/08/74	D	2	Temp 12°C
15P1	J. W. Popenoe	2340	4	48			1.50	9/21/53	D,I	50	Dug Well
19P1	Otis M. Prescott	2000	187	8	28	Vesicular Basalt	127.40	10/30/75	D		
19Q1	Otis M. Prescott	2030	185	10			127.55	10/29/75	I		
20N1	Otis Prescott	2040	427		22	Interbedded Sediments	173.00		I	200	
22H1	Larry Boardman	2080	535	6	25	Vesicular Basalt & Interbedded Sediments	250	3/08/73	D	8	Temp 12°C
22J1	John Bronkhorst	2250	180	6	50		144.65	11/18/74	D	25	
24L1	Ray Gosney	2340	470	6			150	1960	D		Temp 12°C
25L1	L. Case	2160	465	6							
25L2	L. Case	2160	990	8		Fractured Basalt & Interbedded Sediments	435.45	11/18/74	D,I		Geophysical Logs

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
26L1	Unknown	2050	500	5			295	10/09/65	U		
27D1	L. L. Fife	2050	120	6	19				U		No water
27G1	L. L. Lightfoot	2050	114	6			92.00	4/16/75	D		
27N1	K. Henshaw	1920	235	6	204	Vesicular Basalt	140	8/24/73	D	15	Temp 12°C
28B1	Unknown	1880	87						U		No water
30J1	A. L. King	1880	47	6			38.85	10/29/75	D		
31J1	Paul Schilling	1720	645	6	53	Vesicular Basalt	80	1/13/75	I	60	Temp 12°C
32P1	Mike Counts	1700	415	6	24		56.74	10/30/75	D,I	30	
32Q1	Mike Counts	1720	265	8	61		70.72	10/29/75	D,I	60	
33J1	R. E. Hunter	1880	148	8	120				D	5	Temp 12°C
34D1	H. W. Freer	1920	162	6			110.52	10/29/75	D		Temp 11°C
					T. 5 N. R. 16 E.						
6D1	George Wright	3400	310	6	37	Interbedded Sediments	78	1/22/71	D	45	Temp 15°C
22R1	Glenn H. Tyler	2360	731	6	625				D,I		
25K1	K. Zielinski	2180	70	6					D		Flows intermittently
25Q1	Dept. of Health, Education & Welfare	2120	248	5	221		141.84	4/16/75	D	30	Temp 11°C
27M1	Paul Middleton	2200	381	6	87	Vesicular Basalt & Gravel	295	9/09/74	D	5	Temp 12°C
28R1	Mike Austin	2160	310	6	32		231	6/16/72	D	12	Temp 15°C
30E1	R. Hackett	2170	225	10	10	Vesicular Basalt & Gravel	151.60	4/30/74	D	3	
31E1	L. Case	2060	387	6			226.70	5/01/74	D		Temp 12°C
31K1	R. Scheradella	1940	250	6	72	Vesicular Basalt	108.15	4/30/74	D	60	
31R1	Pete Heming	1920	250	6	75	Vesicular Basalt	182	4/18/74	D	20	Temp 12°C

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface: Feet	Water Level Below Land Surface: Date	Use	Yield (gpm)	Remarks
33D1	United Homes Corp.	2160	490	6	54	Interbedded Sediments	238	12/02/70	D	60	
34D1	Norm Evans	2120	385	6	75	Vesicular Basalt & Interbedded Sediments	193	4/22/72	D	60	Temp 13.5°C
35J1	Russell Schroder	2000	130	6	81	Interbedded Sediments	87	4/23/74	D	25	Temp 12°C
36N1	Bill Young	1860	100	6	36	Fractured Basalt	40	6/21/73	D	25	Temp 12°C
						T. 5 N. R. 17 E.					
3L1	Brooks State Park	2600	115	6	91	Clay and Sand	43.60	10/01/75	P	50	Temp 11°C
3N1	G. J. Timmer	2500	160	6	143	Sand and Gravel	35.87	10/29/75	D	45	
14E1	Ed Mantes	2480	33	6			9.20	10/01/75	D		
20N1	Addison Lane	2440	280						D		SWL reported to be 141'
20N2	Addison Lane	2440	700	8	19		561.20	9/14/76	U		
23G1	Trans West Co.	2560	370	6	54	Fractured Basalt	47	10/06/70	T	20-40	Temp 11°C
24M1	Trans West Co.	2520	372	6	104	Vesicular Basalt	289	11/02/70	D	20	Temp 11°C
30M1	Jim Stultz	2180	295	6	62	Vesicular Basalt	210	5/15/73	D	5	Temp 12°C
30N1	Yakima Indian Res.	2180	550	6			258.80	9/15/76	U		
31K1	Darryl Sines	1920	115	6	99	Fractured Basalt	66	5/03/72	D	50	
32D1	Trans West Co.	2000	205	6	19	Vesicular Basalt	45.96	10/27/75	D	17	Temp 12°C
						T. 5. N. R. 18 E.					
29N1	Unknown	2255	300	6					D	5	

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Water Level Below Land Surface Date	Use	Yield (gpm)	Remarks
					T. 5 N. R. 19 E.						
25K1	Rathspeth	2415	20	72			2.30	8/08/75	U		
					T. 5 N. R. 20 E.						
1G1	K. Clark	2710	104.5	6			0.20	8/08/75	S		
4P1	H. Hooker	2835	180	6	10		86.30	5/24/75	D		
8R1	F. Naught	2752		6			20.92	5/24/75	D		
9A1	H. Hooker	2780	145	6	19	Basalt and Interbedded Sediments	0.40	5/24/75	S	60	Temp 13.5^{o}C
10A1	R. Ferguson	2750		6					S		
18L1	Max Slater	2665	110	6	20	Clay and Sand	14.69	6/00/75	D		
19A1	Arlo L. Powers	2600	93	6			12	3/15/71	D,S	5	
22Q1	Sam Berk	2495	275	6					U		SWL reported to be 200'
25K1	Max Slater	2357	40	6		Alluvium	12.75	6/27/75	U		
27C1	Sam Berk	2490	900	12	140		745.00	4/17/72	U		Geophysical Logs
28B1	Berk Brothers, Inc.	2490	330	8	146	Vesicular Basalt	22	3/01/69	I	550	
28Q1	Sam Berk	2395	311	12		Vesicular Basalt & Clay	65.30	5/24/75	I	500	Geophysical Logs
28R1	Berk Brothers, Inc.	2400	410	10	110		83	10/23/69	I		
30N1	Rathspeth	2410	150	6	4	Sand			D		Pump set at 28'
					T. 5 N. R. 21 E.						
3J1	Tom Gray	2378	207	6		Vesicular Basalt	100	7/05/68	D,I	30	
4A1	Tom Gray	2482	84	6			24	8/04/75	S		
6F1	M. Larson	2620	230	6					S		SWL reported to be 160'

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Water Level Below Land Surface Date	Use	Yield (gpm)	Remarks
18B1	H. Busch	2545	160	6					S		
18B2	H. Busch	2535	121	6			116	8/04/75	D	5	
24J1	R. Ferguson	1665	300	6					D		
28E1	K. Clark	2150	300						U		No water
28N1	L. Whitmore	2020	238	6		Vesicular Basalt & Clay	53.20	8/04/75	D		
29H1	K. Clark	2120	116	6			36	11/24/75	D		
					T. 5 N. R. 22 E.						
13Q1	C. McBride	700	80	6		Basalt	Flow	9/15/76	D,S		
20N1	R. Ferguson	1435	16	72		Alluvium	5.90	8/06/75	S		
27A1	A. M. Matson	1105	150	6			51.50	8/06/75	S		
27A2	A. M. Matson	1100	1061	10	144	Basalt	22	2/12/72	I	750	Geophysical Logs
28C1	R. Ferguson	1280	29	72		Alluvium			U		No water
35D1	Unknown	1018	22	72		Alluvium	18.50	8/06/75	S		
					T. 5 N. R. 23 E.						
3A1	Robert J. Petersen	716	87	6			29.3	8/15/75	U		
3A2	Robert J. Petersen	720	250	10	64	Fractured Basalt	30.40	2/13/76	I	403	May have caved in to 102'
3A3	Robert J. Petersen	720	575	12	79	Vesicular Basalt	123.70	9/13/76	U		May have caved in 300' Geophysical Logs
3L1	Robert J. Petersen	820	150	8	132		125	11/00/56	U	95	Hole now dry Temp 16°C
3L2	Robert J. Petersen	820	313				190	1/20/76	I	400	
7A1	M. Mercer	1024							U		
7N1	M. Mercer	824		6					S		
11N1	M. Mercer	719	250	4			165.90	8/09/75	S		
29D1	C. McBride	865	871	16		Basalt	Flow	8/07/77	I	5000	Geophysical logs
35C1	M. Mercer	635	266	8	166	Vesicular Basalt	186.30	8/09/75	D,S	30	

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
					T. 6 N. R. 10 E.						
8B1	Highland	2000	125	6		Gravel	80.5	9/12/75	D		
11F1	Klickitat County PUD #6	2060	173						T		No water
15A2	Klickitat County PUD #13	1943	143				1.0	9/10/75	T		
25M1	Walt Armstrong	1730	224	6	224	Vesicular Basalt	205	11/09/74	D	15	
					T. 6 N. R. 11 E.						
31F1	D. Rummel	1710	211	6			163.9	9/10/75	D		
					T. 6 N. R. 12 E.						
2D1	Francis Bean	1970	131	6			108.8	9/05/75	U		
2E1	D. Lloyd	1950	22	6	22	Vesicular Basalt	7	7/26/74	D	30	Temp 11°C
2M1	H. Kuhnhausen	1948	12	48		Alluvium	3.9	9/05/75	D		
3M1	L. C. Rolph	1980	53	6	34	Sand	6.1	9/05/75	D	9	Backfilled to 50'
3M2	L. C. Rolph	1980	100	6	60		94.5	9/05/75	U		
3M3	Frank Ward	1981	96	6	54	Fractured Basalt	80	10/09/73	U		
10A1	John Finn	1919	38	6			4.01	6/14/74	I	15	
10K1	Glenwood School	1900	255	6			197.40	6/15/76	U		
10M1	U.S. Bureau of Indian Affairs Ranger Station	1935	300	6			227.96	4/05/74	U	67	Temp 6°C
10P1	Ada Conboy	1895	14	36	13	Alluvium	6.90	6/15/76	U		
10P2	Audrey Eaton	1895	265	10			187.34	4/02/74	U		
11E1	L. D. Lloyd	1905	13	36	13	Alluvium	6.60	7/16/74	D		
11E2	L. D. Lloyd	1905	13	36	13	Alluvium	7	7/16/74	D		Temp 10°C
11F1	Flying L Guest Ranch	1905	13.5	48		Alluvium	6.80	9/09/75	D		

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
12R1	Ken Allbritton	1830	30	60	30	Alluvium	1.29	4/02/74	S		
13D1	T. B. Burns	1850	200	6	40		155.26	4/02/74	U		
13M1	B. Valdez	1830	10	48			3.80	9/09/75	S		
14G1	G. Ladiges	1847	16	48			2.30	9/06/75	U		
15Q1	Roy Feller	1852	11	24	6	Alluvium	1.85	2/12/74	U		
16B1	George Hathaway	1875	46	6			15.10	7/19/74	S	7	Temp 10°C
21F1	O. Kuhnhausen	1830	10	36	10	Alluvium	2.41	7/17/74	U		
21F2	O. Kuhnhausen	1830	150	5	50				U		No water
22L1	Paul Ladiges	1833	260	8	84		112.25	9/07/75	D	14	Temp 11°C
23B1	G. Ladiges	1830	195	6			137.20	9/06/75	D,S		
23B2	Ken Sheridan	1830	210	6	82				D		
27D1	E. W. Ziegler	1828	247	8	47		90.20	5/08/74	U	180	
27D2	E. W. Ziegler	1828	10	24	10	Alluvium	2.68	2/13/74	U		
34D1	Conboy Refuge	1822	8	8		Alluvium	1.20	4/05/74	U		
34K1	Conboy Refuge	1830	116	6	20		7.19	5/01/74	U		
34L1	Conboy Refuge	1820	55	8	40	Alluvium	9.00	7/12/74	U		
35H1	Paul Ladiges	1875	104	6			29.60	9/09/75	D		Temp 9°C
					T. 6 N. R. 20 E.						
1P1	Steve Naught	2980	20	72	20	Alluvium	4.50	6/22/75	D		
1P2	Steve Naught	2983							D		
2A1	Dale Johnson	3062	40	72	40	Alluvium	7.08	6/22/75	U		
2A2	Dale Johnson	3061	200	6		Vesicular Basalt			D		
4M1	J. C. Ingram	3260	130	6	35	Vesicular Basalt	22.00	9/18/71	D	45	Temp 11°C
9K1	H. Wilson	3155	167	6	20	Alluvium	0.50	6/24/75	D	22	
9L1	C. Walling	3155	10	72	10	Alluvium	0.42	6/24/75	D	6	
12L1	R. Ferguson	2935	20	72	20	Alluvium	3.33	6/24/75	D	6	
13H1	F. Naught	2862	306	6	33	Fractured Basalt	30.80	6/24/75	U	12	Geophysical Logs

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
13H2	F. Naught	2860	375	6	25	Fractured Basalt	40	8/22/69	D	60	Temp 11°C
15N1	R. J. Rupp	3020	205	6	221	Fractured Basalt	17	2/27/74	D	12	Temp 12°C
16A1	Sheppard	3037		6					U		No water
16A2	Mary Shotwell	3035	100	6					D		
16R1	V. Looney	2040	25	72	25				U		
16R2	H. Wilson	3037	275	6			77.9	6/24/75	D	60	
20R1	Unknown	3030	10		10	Alluvium	8.5	6/25/75	U		
21A1	Batze	3030	225	6			41.0	6/24/75	D		
21A2	L. Whitmore	3030	235	6	19	Vesicular Basalt	64.9	8/05/75	D	60	Temp 12°C
22C1	R. Van Nostern	2990	147	6			6.24	9/13/76	U		
22D1	Whitmore	3002					27.67	6/22/75	U		
22D2	Whitmore #1	3002	175	8	22	Vesicular Basalt	97.30	6/24/75	D	13	Temp 12°C
22D3	L. Goodnight	3007	200	6			30.50	6/22/75	D		
22D4	Keith Jensen	3025	220	4					D		
22D5	G. Crider	3004	236	6			33	8/04/75	D		
22D6	L. Whitmore	3005		36		Alluvium	28.93	9/26/75	U		
22D7	Rupp & Clark	3010									No water
22D8	Rupp & Clark	3010	200	8					D,S		
22D9	G. Larsen	3010	230	6		Interbedded Clay	58.40	6/22/75	D		
22D10	D. Miller	3010							D		
22D11	B. Meyer	3025					30.10	8/22/75	D		
24R1	R. Brown	2792	30	72	30	Alluvium	3.00	8/24/75	U		
24R2	R. Brown	2793	178	6	20		75.75	6/24/75	U		
26D1	Keith Jensen	2918	180	6	21		15.58	6/22/75	D		
27N1	Gordon	2938	100	6			13.70	6/24/75	S		
28R1	J. Gotfertson	2975	213	6					D		

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type or Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
29G1	E. Lasly	3067	200	6					D		
30K1	W. Savage	3038	20	72	20	Alluvium	4.75	6/23/75	D		
30K2	W. Savage	3042	18	72	18	Alluvium	8.42	6/23/75	D		
30K3	Cleveland Park Well	3057	12	48	12	Alluvium	3.50	6/23/75	D		
30M1	Matson Land & Livestock	3120	190	6	19	Vesicular Basalt	120	5/27/73	D	2	Temp 12°C
30Q1	R. Van Nostern	3040		36		Alluvium	7.54	9/13/76	S		
30Q2	Chet Shannon	3040	85	6	63	Vesicular Basalt	1.50	4/25/74	D	25	Temp 11°C
32B1	E. Lasly #2	3022	62	72			48.30	6/23/75	S		
35B1	J. Jensen	2850	227	8	20		23.40	6/24/75	D	15	
36B1	Howard Coleman	2780	408	6	7	Vesicular Basalt	12	10/30/69	S	5	Temp 11°C
36P1	M. Larson	2757	160	6	20		32.80	5/23/75	D	15	
					T. 6 N. R. 21 E.						
4A1	C. McBride	2705	200	6					D		
6L1	A. M. Matsen	2845	12	72	12	Alluvium	4.08	6/24/75	U		
6L2	A. M. Matsen	2880		6			62.50	6/26/75	D	12	
7L1	S. Jensen	2820	200	6			29.50	8/05/75	D	5	
14M1	C. Bromley	2500	25	6					D		
14M2	Roberts	2492		6					D		Buried 6' underground
15L1	L. Giles	2875	12	72	12		6	8/06/75	U		
15L2	L. Giles	2580	220	19		Vesicular Basalt	149	10/30/73	D	30	Temp 11°C
17R1	C. Everett	2710	300						U		
18E1	Francis Naught	2842	82	6	20		7.75	8/06/75	S	6	
18R1	C. Everett	2787	165	6			21.40	8/06/75	D,S		
19Q1	Bud Matsen	2787	865	6	53		700	8/15/74	D,S		
20Q1	T. Juris	2800	270	9		Interbedded Clay			D		

Well Number	Owner or Tenant	Altitude (ft)	Depth (ft)	Diameter (in)	Depth of Casing (ft)	Type of Water-producing Materials	Water Level Below Land Surface Feet	Date	Use	Yield (gpm)	Remarks
24A1	Van Horn	2220	103	6		Interbedded Clay			D		SWL reported to be 40'
28D1	Elwood Brown	2670	310	6	19		276	8/31/76	D		Geophysical Logs
31F1	Howard Coleman	2744	600						U		
31F2	Howard Coleman	2740	300	6		Blue Clay	270.25	9/13/76	U		Geophysical Logs
31F3	Howard Coleman	2741	415	6	5				U		
31F4	Howard Coleman	2738	278	8			196.60	9/13/76	U		Geophysical Logs
34N1	Tom Gray	2477	104	6			51.85	8/04/75	U		
35P1	Tom Gray	2360	300	6	78		75	9/01/76	D		
					T. 6 N. R. 22 E.						
25J1	M. Mercer	1325	112	6			2.90	9/09/75	S		
					T. 6 N. R. 23 E.						
10N1	Robert Andrews	1142	45	6					U		No water
11Q1	Robert Andrews	1020	208	8	150						
11Q2	Robert Andrews	1020	892	12	155		Flow	2/10/71	I	2500	Flowing at 35 psi Temp 23.5°C
15H1	Robert Andrews	1050	950	12	128	Interbedded Gravel	Flow	8/15/75	I	2200	Geophysical Logs Flowing at 35 psi
16P1	Dept. of Natural Res. (Feezell)	1096	950	16	80	Vesicular Basalt	40.8	7/22/76	I	2850	Temp 22°C Geophysical Logs
22J1	Robert Andrews	960	1070	12	370		380	7/22/76	I	1700	
28R1	M. Mercer	863	16	48	16	Alluvium	8.9	8/11/75	S		
34H1	Don Mercer	868	107	6			96.4	8/09/75	U		
34H2	Don Mercer	865	425	6		Fractured Basalt	231.4	8/09/75	D	200	
34H3	Don Mercer	806	550	8			287.7	8/09/75	D,S		

APPENDIX C

Driller's Logs from Selected Wells, Klickitat County, Washington

2/13-16L1. Cecil L. Odom. Altitude about 300 ft. Drilled by Gorge Contractors, Inc., 1970. Cased to 53 ft.

Material	Thickness (ft)	Depth (ft)
Sand	12	12
Gravel; sand	33	45
Sand, fine	6	51
Wood, hard	1	52
Basalt, vesicular, hard	10	62
Basalt, fractured, brown	55	117
Basalt, vesicular, brown	3	120
Basalt, vesicular, gray	28	148
Basalt, hard, black, water-bearing	18	166
Basalt, vesicular, gray	13	179
Basalt, hard, black	5	184
Basalt, hard, gray	7	191

2/13-16P3. Frank Healey. Altitude about 280 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 19 ft.

Material	Thickness (ft)	Depth (ft)
Clay; sand, black	13	13
Sand; gravel; boulders	7	20
Basalt, vesicular, gray	20	40
Basalt, fractured, gray	22	62
Basalt, gray	6	68
Sandstone, brown	10	78
Basalt	34	112
Basalt, vesicular, brown and gray	18	130

2/13-22P1. W. H. Gregory. Altitude about 280 ft. Drilled by Project Corporation, 1973. Cased to 20 ft.

Material	Thickness (ft)	Depth (ft)
Basalt, hard, gray	132	152
Basalt, fractured	41	193
Basalt, hard, red and black	59	252
Basalt, broken	33	285

2/13-27B1. Lawrence Tidyman. Altitude about 235 ft. Drilled by Harold Leonard, 1953. Cased to 20 ft.

Material	Thickness (ft)	Depth (ft)
Sand; gravel	7	7
Basalt, medium hard, gray	58	65
Clay; rock [basalt]	45	110
Basalt, soft, black, show of water	36	146
Clay, green	19	165
Clay, green	7	172
Basalt, black	8	180
Basalt, medium hard, gray-blue	50	230
Basalt, black, water-bearing	24	254
Basalt, soft, black	26	280

2/13-28F1. Harry Toda. Altitude about 180 ft. Drilled by Murray Well Drilling Co., 1972. Cased to 170 ft.

Material	Thickness (ft)	Depth (ft)
Soil	6	6
Basalt, weathered	7	13
Basalt, blue	9	22
Basalt, weathered	5	27
Basalt, fractured, SWL 5'	3	30
Basalt, black	36	66
Claystone, blue	2	68
Basalt, black, SWL 18'	9	77
Clay, gray	18	95
Clay, light blue	20	115
Clay, yellow	10	125
Clay, blue-gray and brown	3	128
Basalt, gray, SWL 79'	42	170

2/13-28R2. Cecil L. Odom. Altitude about 190 ft. Drilled by Cecil C. Nickols, 1963. Cased to 40 ft.

Material	Thickness (ft)	Depth (ft)
Sand	3	3
Basalt	29	32
Clay; gravel	3	35
Basalt, hard, black	20	55
Clay; gravel	20	75
Basalt, black	3	78

(continued)

Material	Thickness (ft)	Depth (ft)
2/13-28R2. Continued.		
Clay; gravel	8	86
Basalt	4	90

2/13-34L1. Dalles City. Altitude about 235 ft. Drilled by D. William, 1932. Cased to 42 ft.

Material	Thickness (ft)	Depth (ft)
Basalt, black	49	49
Basalt, black	45	94
Basalt, blue	14	108
Basalt, gray	48	156
Faulted formation (basalt, broken)	80	236
Basalt, gray	94	330
Basalt, blue	11	341
Basalt, soft, black, some water	21	362
Basalt, gray	151	513
Basalt, soft, black, water-bearing	28	541

2/14-19F1. U.S. Corps of Engineers. Altitude about 180 ft. Drilled by Haakon I. Bottner Drilling Co., 1961. Cased to 105 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil, sandy	5	5
Sand; silt	50	55
Sand, heavy, black	5	60
Sand; gravel, some water	18	78
Clay, brown; sand	3	81
Rock [boulders]; clay	4	85
Gravel, water-bearing	15	100
Sand, heavy, black	5	105

2/16-3D3. Lee Ritter. Altitude about 180 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 19 ft.

Material	Thickness (ft)	Depth (ft)
Sand, brown	8	8
Basalt, gray	80	88
Basalt, vesicular and fractured, gray; clay	5	93

(continued)

Material	Thickness (ft)	Depth (ft)
2/16-3D3. Continued.		
Basalt, vesicular, gray	9	102
Basalt, black	17	119
Basalt, gray	82	201
Basalt, vesicular, black	3	204
Shale [clay], brown; sand	11	215
Clay, black	1	216
Clay; sand	9	225
Sandstone, gray	5	230
Clay, white	2	232
Basalt, vesicular, black; sand; clay	3	235
Rock [basalt], vesicular, gray-brown	15	250

3/10-2B1. Pacific Power and Light Co. Altitude about 380 ft. Drilled by Richard J. Murray, 1973. Cased to 27 ft.

Material	Thickness (ft)	Depth (ft)
Soil; rock, broken	4	4
Boulders	3	7
Rock [basalt], broken, SWL 8'	2	9
Sand, fine, brown	3	12
Rock [basalt], gray	19	31
Conglomerate [gravel], medium, water-bearing, SWL 5'	5	36
Rock [basalt], hard, gray	4	40

3/10-13R1. Arthur F. Moore. Altitude about 800 ft. Drilled by Hansen Drilling Company, Inc., 1968. Cased to 538 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	1	1
Clay, red	2	3
Clay, brown	4	7
Boulders	11	18
Rock [basalt?], hard, black	56	74
Clay	16	90
Clay; gravel	13	103
Gravel; clay, brown	27	130
Layer of rock [basalt], trace of water	30	160

(continued)

Material	Thickness (ft)	Depth (ft)
3/10-13R1. Continued.		
Rock [basalt], hard, black and brown	6	166
Rock [basalt], broken	182	348
Rock [basalt], broken	30	378
Rock [basalt]	15	393
Rock [basalt]	24	417
Rock [basalt]	60	477
Broken [basalt, fractured]	8	485
Rock [basalt], hard, gray and black	7	492
Rock [basalt], very hard	36	528
Rock [basalt], broken, water-bearing	9	537
Rock [basalt], hard, gray	6	543
3/11-7B1. Merlin Yarnell. Altitude about 1330 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 116 ft.		
Clay, brown	33	33
Basalt, gray	49	82
Basalt, fractured; clay	34	116
Basalt, fractured; clay	18	134
Basalt, gray	4	138
Gravel, cemented; clay	37	175
3/11-8D2. Robert Allen. Altitude about 1640 ft. Drilled by Swift Water Well Drilling, Inc., 1974. Cased to 60 ft.		
Topsoil	2	2
Clay, brown	4	6
Clay, light brown	6	12
Clay; boulders	8	20
Basalt, hard	3	23
Basalt, fractured	5	28
Basalt, decomposed	30	58
Basalt, hard	7	65
Sandstone, blue	5	70
Clay, blue	10	80

Material	Thickness (ft)	Depth (ft)
3/11-9A1. Lynn Comer. Altitude about 1910 ft. Drilled by Swift Water Well Drilling, Inc., 1974. Cased to 41 ft.		
Topsoil	2	2
Clay, brown	16	18
Sand; gravel, cemented	22	40
Basalt, decomposed	10	50
Basalt, fractured	18	68
Basalt, hard, black	20	88
Basalt, fractured	42	130
Sandstone, blue	15	145
Sandstone, brown	10	155
Basalt, brown	25	180
3/11-10C1. Charles A. Saylor. Altitude about 1860 ft. Drilled by Project Corporation, 1973. Cased to 52 ft.		
Soil; clay	20	20
Clay, brown	12	32
Basalt, hard, gray	6	38
Clay, brown; basalt, fractured, weathered	52	90
Basalt, hard, gray	46	136
Basalt, red; clay	38	174
Basalt, hard, gray	36	210
Basalt, fractured, yellow and red	15	225
3/11-11N1. Bruce Amoss. Altitude about 1996 ft. Drilled by Norris Drilling and Pump Co., Inc., 1974. Cased to 148 ft.		
Topsoil	1	1
Clay, brown	17	18
Clay, brown	37	55
Rock [basalt], broken, gray	6	61
Rock [basalt], soft, multi-colored	9	70
Ash [clay?]	38	108
Rock [basalt]; clay, water-bearing	22	130
Rock [basalt], medium hard, gray, water-bearing	18	148

Material	Thickness (ft)	Depth (ft)
3/11-17J1. Glen C. Wildebour. Altitude about 2190 ft. Drilled by Swift Water Well Drilling, Inc., 1974. Cased to 64 ft.		
Clay, fine, dark brown ------------	6	6
Clay, sandy, medium brown ---------	4	10
Clay, light brown; gravel, small; sand, wet ----------------------	34	44
Sand, fine; clay; cinders [basalt], red ----------------------------	14	58
Basalt, soft, gray ----------------	4	62
Basalt, hard, gray-black ----------	54	116
Basalt, hard, fractured, weathered, water-bearing ------------------	24	140
3/11-18C1. H. B. Larsen. Altitude about 1000 ft. Drilled by Charles Henderson and H. B. Larsen, 1970. Cased to 300 ft.		
Clay -----------------------------	2	2
Andesite [basalt] -----------------	102	104
Cinders [basalt] ------------------	6	110
Cinders [basalt]; clay ------------	12	122
Basalt ---------------------------	9	131
Clay, green ----------------------	5	136
Basalt, fractured -----------------	49	185
Chlorite [clay] -------------------	12	197
Basalt, fractured -----------------	13	210
Sand; obsidian [basalt] -----------	15	225
Basalt, fractured -----------------	33	258
Clay, green; basalt, decomposed ---	22	280
Soapstone; shale [clay] -----------	9	289
Shale [clay]; basalt, decomposed --	6	295
Basalt ---------------------------	5	300
3/11-18F3. Merlin Yarnell. Altitude about 920 ft. Drilled by Ralph Turner Drilling Company, 1968. Cased to 35 ft.		
Topsoil ---------------------------	2	2
Clay, yellow ----------------------	8	10

(continued)

Material	Thickness (ft)	Depth (ft)
3/11-18F3. Continued.		
Rock [basalt], decomposed ---------	8	18
Sandstone, hard, brown ------------	62	80
Basalt, gray ----------------------	20	100
Rock [basalt], brown --------------	40	140
Rock [basalt], brown --------------	8	148
Basalt, gray ----------------------	62	210
Lava [basalt], red ----------------	6	216
Rock [basalt], brown --------------	54	270
Lava rock [basalt], broken, brown -	20	290
Basalt, gray ----------------------	20	310
Rock [basalt], brown --------------	25	335
3/11-18P1. Charles L. Jeter. Altitude about 890 ft. Drilled by O'Leary Well Drilling, Inc., 1970. Cased to 39 ft.		
Unknown ---------------------------	40	40
Basalt, gray ----------------------	2	42
Basalt, fractured -----------------	6	48
Basalt, gray ----------------------	103	151
Basalt, fractured -----------------	7	158
Basalt, gray ----------------------	2	160
Basalt, fractured, vesicular; clay	13	173
Basalt, fractured -----------------	2	175
Gravel; sand; clay ----------------	7	182
Basalt, vesicular; clay -----------	8	190
3/11-20D1. Don Ramsay. Altitude about 2000 ft. Drilled by Swift Water Well Drilling, Inc., 1974. Cased to 126 ft.		
Clay, fine, light brown -----------	9	9
Sand; gravel; clay ----------------	14	23
Basalt, cinders [vesicular], weathered -----------------------	15	38
Basalt, fractured, black ----------	12	50
Basalt, weathered, black ----------	8	58
Basalt, decomposed ----------------	14	72

(continued)

Material	Thickness (ft)	Depth (ft)
3/11-20D1. Continued.		
Basalt, fractured, black ----------	5	77
Basalt, decomposed ----------------	3	80
Clay ------------------------------	2	82
Clay, coarse, yellow --------------	7	89
Clay, fine, gray ------------------	21	110
Basalt, hard, fractured, weathered, black --------------------------	8	118
Basalt, hard, black ---------------	12	130
Basalt, hard, weathered, fractured, black, water-bearing ------------	30	160

3/11-28D1. Don Ramsey. Altitude about 2250 ft. Drilled by Swift Water Well Drilling, Inc., 1974. Cased to 63 ft.

Material	Thickness (ft)	Depth (ft)
Clay, medium brown ----------------	23	23
Clay, dark brown ------------------	17	40
Gravel; sand; clay ----------------	20	60
Basalt, fractured, decomposed -----	50	110
Cinders [basalt]; cobbles ---------	30	140
Basalt, soft, porous, black -------	22	162
Basalt, hard, fractured, black ----	4	166
Basalt, hard, black ---------------	14	180
Cinders [basalt]; cobbles ---------	6	186
Basalt, hard, black ---------------	216	402
Basalt, fractured, weathered, black	58	460
Basalt, fractured, weathered, black	70	530
Basalt, medium hard, black --------	30	560
Basalt, fractured, black ----------	2	562
Basalt, hard, black ---------------	38	600

3/11-30F2. Underwood Fruit Co. Altitude about 120 ft. Drilled by Project Corporation, 1972. Cased to 185 ft.

Material	Thickness (ft)	Depth (ft)
Soil, sandy; cobbles --------------	7	7
Basalt, perforated [vesicular], fractured, brown and gray --------	18	25
Basalt, hard, fractured, gray -----	32	57

(continued)

Material	Thickness (ft)	Depth (ft)
3/11-30F2. Continued.		
Basalt, hard, fractured, gray -----	61	118
Basalt, fractured, brown and gray -	4	122
Basalt, fractured, gray -----------	23	145
Basalt, brown and red, 1 to 2 gpm -	5	150
Basalt, hard, dark gray, water-bearing -------------------------	45	195
Basalt, fractured, 300-500 gpm ----	27	222
Basalt, fractured, hard, gray -----	35	257

3/12-1E1. Robert Schwagerl. Altitude about 2020 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 65 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown -----------------------	32	32
Clay, brown -----------------------	28	60
Sandstone, gray -------------------	40	100
Basalt, fractured, vesicular, gray, water-bearing -------------------	20	120
Basalt, gray ----------------------	10	130

3/12-3R1. Cascade Pacific Properties. Altitude about 1950 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 24 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown -----------------------	4	4
Clay, brown -----------------------	20	24
Basalt, gray ----------------------	19	43
Conglomerate [gravel]; shale [clay]; basalt, 1 1/2 gpm -------	46	89
Basalt, gray and brown ------------	54	143
Basalt, vesicular, black, 1 1/2 gpm	20	163
Basalt, fractured, gray -----------	117	280

Material	Thickness (ft)	Depth (ft)
3/12-6K1. H. Robert Cole. Altitude about 2330 ft. Drilled by Murray Well Drilling, 1974. Cased to 83 ft.		
Soil ------------------------------	1	1
Clay, light brown -----------------	50	51
Conglomerate [gravel], medium, SWL 55' ------------------------	27	78
Basalt, hard, gray ----------------	32	110
3/12-13G1. James Block. Altitude about 1500 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 19 ft.		
Clay, brown -----------------------	6	6
Shale [clay]; boulders ------------	6	12
Basalt, gray ----------------------	119	131
Basalt, fractured, black; clay ----	31	162
Basalt, gray ----------------------	26	188
Basalt, gray ----------------------	12	200
3/12-15G1. Francis H. Keyes. Altitude about 1440 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 25 ft.		
Basalt; boulders; clay ------------	4	4
Clay ------------------------------	18	22
Conglomerate [gravel] -------------	63	85
3/12-21H1. Ed Wegner. Altitude about 1000 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 50 ft.		
Clay, brown -----------------------	14	14
Basalt, gray ----------------------	8	22
Clay, sandy, brown ----------------	23	45
Basalt, fractured, gray -----------	107	152
Basalt, vesicular, fractured; clay	15	167
Basalt, gray ----------------------	8	175

Material	Thickness (ft)	Depth (ft)
3/12-27N1. Boolin. Altitude about 570 ft. Drilled by Hansen Drilling Co., Inc., 1968. Cased to 110 ft.		
Basalt, broken, gray --------------	2	2
Basalt, gray ----------------------	68	70
Basalt, blue ----------------------	5	75
Basalt, gray ----------------------	20	95
Basalt, broken, gray, water-bearing	16	111
3/12-32H1. Washington Dept. of Highways. Altitude about 300 ft. Drilled by Hansen Drilling Co., Inc., 1968. Cased to 250 ft.		
Topsoil, sandy --------------------	5	5
Sand, fine, brown -----------------	6	11
Sand, fine, light brown -----------	1	12
Basalt, broken, blue --------------	2	14
Basalt, blue ----------------------	10	24
Rock [basalt?], hard --------------	29	53
Basalt, hard, blue ----------------	12	65
Basalt, medium, blue, 1 1/2 gpm ---	3	68
Basalt, medium, black -------------	13	81
Basalt, hard, black ---------------	24	105
Basalt, broken, medium, gray ------	9	114
Basalt, hard, gray ----------------	42	156
Basalt, hard, gray ----------------	10	166
Basalt, medium, gray --------------	11	177
Basalt, hard, gray ----------------	10	187
Basalt, medium, gray --------------	40	227
Basalt, hard, black ---------------	6	233
Basalt, broken, hard, black -------	1	234
Basalt, hard, black ---------------	11	245
Basalt, broken, hard, black -------	2	247
Basalt, hard, black ---------------	3	250

Material	Thickness (ft)	Depth (ft)
3/13-5B1. Harry Miller. Altitude about 400 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 38 ft.		
Basalt, fractured, gray	12	12
Basalt, gray	8	20
Boulders; gravel; sand	18	38
Basalt, fractured, gray, water-bearing	15	53
Basalt, fractured, black	2	55
3/13-15C1. Beattie Ranch. Altitude about 2000 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 37 ft.		
Clay, brown	32	32
Basalt, vesicular, gray	163	195
Basalt, vesicular, gray, black and brown; clay, water-bearing	5	200
Basalt, gray	50	250
3/13-23L1. Doug Taylor. Altitude about 1800 ft. Drilled by Murray Well Drilling, 1973. Cased to 29 ft.		
Soil, brown	3	3
Rock [basalt], broken	2	5
Clay, brown	3	8
Basalt, vesicular	28	36
Basalt, hard, gray	6	42
Rock [basalt], black and red, SWL 35'	18	60
Basalt, hard, gray	47	107
Claystone, black	6	113
Basalt, black	31	144
Basalt, hard, gray	18	162
Basalt; clay	3	165
Basalt, gray	17	182
Basalt, blue	13	195
Basalt, gray	9	204

Material	Thickness (ft)	Depth (ft)
3/13-28L1. E. H. Struck. Altitude about 1550 ft. Drilled by Richard J. Murray, 1972. Cased to 43 ft.		
Soil; gravel	4	4
Clay, brown	7	11
Conglomerate [gravel]	3	14
Clay, brown	3	17
Conglomerate [gravel]	2	19
Clay, brown, SWL 8'	18	37
Rock [basalt], brown	5	42
Rock [basalt], hard, gray	4	46
Basalt, vesicular	21	67
Basalt, hard, blue	11	78
Basalt, vesicular	12	90
3/13-31L1. Wallace Regets. Altitude about 1250 ft. Drilled by Richard J. Murray, 1974. Cased to 220 ft.		
Soil	4	4
Clay, light brown	16	20
Conglomerate [gravel], medium	15	35
Rock [basalt?], hard, gray	6	41
Clay, light brown	19	60
Clay, white	18	78
Clay, light brown	27	105
Sandstone, light brown	20	125
Clay, brown	8	133
Sandstone, gray	7	140
Clay, soft, gray	3	143
Sandstone, gray	11	154
Clay, gray	20	174
Sandstone, gray	16	190
Sand, fine, light brown, water-bearing	20	210
Clay, brown	15	225
Clay, white	12	237
Sandstone, gray, SWL 177'	8	245

3/14-3P1. Hartford Land Corp. Altitude about 1860 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 24 ft.

Material	Thickness (ft)	Depth (ft)
Clay; boulders	3	3
Shale [clay], brown	17	20
Basalt, gray	175	195
Basalt, fractured, gray	5	200
Basalt, gray	20	220

3/14-9Q1. Alvin Randall. Altitude about 1980 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Deepened by O'Leary Well Drilling, Inc., 1974. Cased to 19 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	2	2
Boulders	6	8
Basalt, gray	23	31
Basalt, fractured, gray	2	33
Basalt, gray	31	64
Basalt, fractured, gray	13	77
Basalt, vesicular, black	11	88
Basalt, gray	162	250
Basalt, fractured, gray	62	312
Basalt, fractured, water-bearing	15	327
Basalt, fractured, gray	88	415

3/14-12J1. Virginia Fahlenkamp. Altitude about 1840 ft. Drilled by Riebe Well Drilling, 1967. Cased to 22 ft.

Material	Thickness (ft)	Depth (ft)
Clay	1	1
Rock [basalt], broken; clay	20	21
Basalt, creviced [fractured], trace of water	99	120
Basalt, broken, black	6	126
Basalt, gray	24	150
Basalt, broken, black	12	162
Basalt, gray	55	217
Clay, brown, water-bearing	15	232

3/14-19L2. Carl Parrish. Altitude about 1870 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 19 ft.

Material	Thickness (ft)	Depth (ft)
Clay; boulders	15	15
Basalt	68	83
Basalt, vesicular	24	107
Basalt, fractured	79	186
Basalt	106	292
Basalt, fractured	15	307
Basalt, vesicular	3	310

3/14-29B1. Jim Heglin. Altitude about 1650 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 87 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	82	82
Basalt, fractured, gray, water-bearing	36	118
Basalt, gray	80	198
Basalt, vesicular, black	14	212
Basalt, gray	120	332

3/15-2J1. Randy Enyeart. Altitude about 1570 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 19 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	9	9
Shale [clay], brown	3	12
Clay, brown	3	15
Basalt, gray	32	47
Shale [clay], hard, brown	5	52
Clay, soft, yellow	10	62
Claystone, yellow-green	5	67
Basalt, vesicular, brown; clay	3	70
Basalt, vesicular, brown	6	76
Basalt, vesicular, gray	2	78
Basalt, fractured, gray	5	83
Basalt, gray	152	235
Basalt, fractured, black	2	237
Basalt, vesicular, black	17	254
Basalt, fractured, gray	8	262
Basalt, gray	138	400

Material	Thickness (ft)	Depth (ft)
3/15-3J1. Calvin Linden. Altitude about 1680 ft. Drilled by Riebe Well Drilling, 1966.		
Topsoil	1	1
Clay	25	26
Gravel, cemented; boulders	6	32
Gravel, cemented; boulders; basalt, weathered	32	64
Basalt, black	28	92
Clay, red	13	105
Clay, brown; rock [basalt]	3	108
Clay, sandy	2	110
Basalt	14	124
Conglomerate [gravel]	15	139
Basalt, crevice [fractured]	149	288
Basalt, gray	16	304
Basalt, broken and porous, water-bearing	6	310
Basalt, gray	152	462
Fault [basalt, fractured], water-bearing	1	463
Basalt, crevice [fractured]	22	485
Basalt, broken, water-bearing	13	498
Basalt, broken and porous	34	532
Basalt, gray	53	585
Lava [basalt], crevice [fractured]	7	592
Basalt, weathered and crevice [fractured]	12	604
Basalt, broken, black; silt, water-bearing	3	607
Basalt, crevice [fractured], black	15	622
3/15-7D1. Virginia Nygaard. Altitude about 1950 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Deepened by Murray Well Drilling Co., 1972. Cased to 20 ft.		
Clay, brown	6	6
Clay, brown	8	14
Basalt, gray	25	39
Sandstone, brown	5	44

(continued)

Material	Thickness (ft)	Depth (ft)
3/15-7D1. Continued.		
Claystone, brown	10	54
Basalt, gray	6	60
Sandstone, gray	3	63
Basalt, gray	32	95
Basalt, vesicular, black	18	113
Basalt, fractured, gray	4	117
Basalt, gray	23	140
Basalt, vesicular, gray; clay	8	148
Basalt, fractured, brown	6	154
Basalt, fractured, gray	6	160
Basalt, gray	15	175
Basalt, fractured, vesicular, gray; clay	4	179
Basalt, vesicular, gray; clay	3	182
Basalt, fractured, gray	5	187
Basalt, gray	48	235
Basalt, gray	61	296
Basalt, vesicular	2	298
Basalt, gray	12	310
3/15-8R2. Harold Isaacson. Altitude about 1630 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 50 ft.		
Clay, brown	5	5
Clay; basalt, broken	40	45
Basalt, fractured, gray	10	55
Basalt, vesicular, fractured, brown and gray; clay, water-bearing	13	68
Clay, green	2	70
3/15-10R1. Ed Bean. Altitude about 1605 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 26 ft.		
Clay, brown	22	22
Clay, brown	3	25
Boulder, hard, gray	2	27

(continued)

Material	Thickness (ft)	Depth (ft)
3/15-10R1. Continued.		
Clay, brown ----------------------	3	30
Basalt, gray ---------------------	4	34
Shale [clay], brown --------------	6	40
Basalt, gray ---------------------	22	62
Shale [clay], brown --------------	8	70
Shale [clay], brown; basalt, fractured, gray --------------------	12	82
Basalt, vesicular, gray; shale [clay] ------------------------	3	85
Basalt, fractured and vesicular, brown and gray -----------------	15	100

3/15-11N1. Harry Emerson. Altitude about 1600 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 47 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown ----------------------	5	5
Clay, sandy, brown ---------------	29	34
Sandstone; clay, brown -----------	3	37
Basalt, vesicular, gray ----------	1	38
Sandstone, brown; clay -----------	8	46
Conglomerate [gravel]; basalt; clay, water-bearing ------------	54	100

3/15-12R1. Stewart Basse. Altitude about 1600 ft. Drilled by Riebe Well Drilling, 1966. Cased to 57 ft.

Material	Thickness (ft)	Depth (ft)
Loam, black; clay ----------------	2	2
Clay, white ----------------------	21	23
Clay, sandy, water-bearing, 10 gpm	17	40
Clay, white ----------------------	15	55
Sand, fine to coarse, water-bearing, 30 gpm ----------------	13	68
Clay; boulders -------------------	4	72
Sand, coarse; boulders, water-bearing, 10 gpm ----------------	8	80
Gravel, cemented; boulders --------	5	85
Gravel, water-bearing, 20 gpm -----	1	86

(continued)

Material	Thickness (ft)	Depth (ft)
3/15-12R1. Continued.		
Clay, sandy ----------------------	11	97
Clay, blue -----------------------	8	105
Sandstone, water-bearing ----------	18	123
Gravel, cemented -----------------	9	132
Basalt, weathered and creviced [fractured], black -------------	36	168
Boulders, porous; gravel, cemented; clay, white, water-bearing ------	39	207
Basalt, creviced [fractured], black	30	237
Basalt, gray; conglomerate [gravel]	18	255
Basalt, porous, blue-black, small amount of water ----------------	12	267
Basalt, brown, water-bearing ------	3	270
Basalt, weathered, black, small amount of water ----------------	15	285
Basalt, creviced [fractured], black, water-bearing -----------	20	305
Basalt, creviced [fractured], gray, small amount of water ----------	32	337

NOTE: bulk of water coming between 200' and 325' level

3/15-13C1. Stewart Basse. Altitude about 1595 ft. Drilled by Riebe Well Drilling, 1967. Cased to 42 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil --------------------------	3	3
Sandstone; clay ------------------	87	90
Conglomerate [gravel], water-bearing -----------------------	40	130
Basalt; clay ---------------------	23	153
Scoria, water-bearing ------------	2	155
Basalt, water-bearing ------------	77	232

3/15-19J1. Glen F. Smith, et al. Altitude about 1565 ft. Drilled by Riebe Well Drilling, 1966. Cased to 52 ft.

Material	Thickness (ft)	Depth (ft)
Soil, hard, sandy, water-bearing --	8	8
Clay, sandy, gravelly ------------	39	47
Sandstone; pumice; clay ----------	3	50
Gravel, cemented; boulders --------	7	57

(continued)

Material	Thickness (ft)	Depth (ft)
3/15-19J1. Continued.		
Clay, white; sand; gravel ---------	24	81
Sand, coarse; gravel, 40 gpm ------	4	85
Clay, burned, red ----------------	9	94
Rock [basalt], heavy, 90 gpm ------	3	97
Basalt, broken, >100 gpm ---------	5	102

3/15-20L1. Quentin Jaekel. Altitude about 1560 ft. Drilled by Riebe Well Drilling, 1968. Cased to 73 ft.

Material	Thickness (ft)	Depth (ft)
Clay, sandy, black ---------------	15	15
Clay, sandy, caving, water-bearing	40	55
Gravel, cemented; boulders --------	27	82
Clay; boulders; sand; gravel ------	41	123
Clay; rock [basalt] --------------	4	127
Basalt, broken; clay -------------	33	160
Basalt, gray; clay, very hard (from 232-245 ft.) -------------------	87	247
Soil [clay], decomposed, black, water-bearing ------------------	5	252
Clay, bright yellow; gravel, water-bearing ----------------------	4	256
Clay, hard; gravel, water-bearing -	3	259
Basalt, creviced [fractured], gray	3	262

3/15-22H2. Washington Dept. of Natural Res. Altitude about 1590 ft. Drilled by L & L Drilling, Inc., 1971. Cased to 286 ft.

Material	Thickness (ft)	Depth (ft)
Soil ----------------------------	25	25
Soil; clay -----------------------	73	98
Clay ----------------------------	9	107
Clay, very soft ------------------	95	202
Clay; soil -----------------------	15	217
Basalt, soft, broken -------------	43	260
Basalt, medium -------------------	26	286
Basalt, hard ---------------------	34	320
Gravel ---------------------------	5	325
Basalt, medium -------------------	16	341
Basalt, hard, gray ---------------	49	390

(continued)

Material	Thickness (ft)	Depth (ft)
3/15-22H2. Continued.		
Clay, black ----------------------	11	401
Basalt, hard ---------------------	43	444
Basalt, hard, gray ---------------	131	575
Basalt, broken, water-bearing -----	41	616
Basalt, firm ---------------------		

3/15-28P1. William Garner. Altitude about 1640 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 208 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown ----------------------	10	10
Clay, brown ----------------------	2	12
Clay, sandy, light brown ----------	18	30
Clay, light brown -----------------	84	114
Claystone, gray ------------------	24	138
Claystone, blue ------------------	4	142
Clay, greenish-blue ---------------	3	145
Clay, gray -----------------------	5	150
Claystone, gray ------------------	18	168
Claystone, gray; gravel -----------	8	176
Shale [clay], brown ---------------	4	180
Basalt, fractured, black ----------	6	186
Basalt, gray ---------------------	3	189
Shale [clay], brown ---------------	5	194
Clay, red ------------------------	6	200
Basalt, vesicular, brown ----------	8	208
Basalt, fractured, gray -----------	12	220
Basalt, gray ---------------------	40	260
Basalt, vesicular, gray -----------	7	267
Basalt, vesicular, brown ----------	43	310
Basalt, brown --------------------	1	311

3/16-2D1. Chuck Young. Altitude about 1780 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 27 ft.

Material	Thickness (ft)	Depth (ft)
Clay; boulders -------------------	21	21
Basalt, fractured -----------------	153	174

(continued)

Material	Thickness (ft)	Depth (ft)
3/16-2D1. Continued.		
Basalt, vesicular, fractured, gray, water-bearing -------------------	17	191
Basalt, gray ---------------------	4	195
3/16-3B1. Clyde M. Story. Altitude about 1750 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 71 ft.		
Unknown --------------------------	42	42
Basalt, fractured, gray -----------	21	63
Clay, white and brown ------------	4	67
Basalt, vesicular; clay, red, water-bearing ------------------	16	83
Basalt, gray ---------------------	2	85
3/16-7Q1. Stewart Basse. Altitude about 1590 ft. Drilled by Riebe Well Drilling, 1969. Cased to 120 ft.		
Clay; gravel, brown --------------	4	4
Sand; gravel; clay, cemented ------	8	12
Clay; gravel; boulders ------------	18	30
Gravel, loosely cemented ----------	10	40
Clay; sand; gravel; boulders ------	17	57
Basalt; boulders; clay ------------	7	64
Conglomerate [gravel]; boulders ---	33	97
Basalt, broken; clay --------------	33	130
Conglomerate [gravel]; clay; boulders; water-bearing ---------	65	195
Basalt; clay, water-bearing -------	29	224
Basalt, fractured, gray -----------	8	232
Basalt, fractured, gray, water-bearing ------------------------	18	250
Basalt, brecciated, black ---------	5	255
Basalt, fractured, gray -----------	7	262
Lava [basalt], black; clay; gravel	18	280
Basalt, fractured, black ----------	8	288
Basalt, fractured, gray -----------	14	302

Material	Thickness (ft)	Depth (ft)
3/16-8J1. Frank Linden. Altitude about 1660 ft. Drilled by Riebe Well Drilling, 1969. Cased to 120 ft.		
Soil; clay, black ----------------	5	5
Clay, hard, white; gravel, SWL 39'	34	39
Clay; gravel; rock [basalt], decomposed, hard, broken, water-bearing ------------------------	21	60
Sand; gravel; clay, water-bearing -	20	80
Basalt, broken, weathered ---------	15	95
Clay; boulders -------------------	15	110
Basalt, broken -------------------	9	119
Basalt, gray ---------------------	6	125
Basalt, broken, weathered ---------	5	130
Basalt, very hard, gray -----------	43	173
Basalt, black --------------------	9	182
Basalt, weathered; clay -----------	24	206
Basalt, badly creviced [fractured], black --------------------------	34	240
Clay, blue; lava [basalt], broken, yellow, water-bearing -----------	26	266
Basalt, broken, black ------------	6	272
Basalt, very hard, badly creviced [fractured], gray --------------	80	352
3/16-12D1. Gale Hiler. Altitude about 2,000 ft. Drilled by O'Leary Well Drilling, Inc., 1970. Cased to 19 ft.		
Clay, brown ----------------------	5	5
Shale [clay], brown --------------	8	13
Basalt, gray ---------------------	115	128
Basalt, vesicular, brown ----------	5	133
Basalt, fractured, gray -----------	116	249
Basalt, fractured, gray, water-bearing ------------------------	1	250
Basalt, fractured, gray -----------	45	295

3/16-18D3. Calvin Linden. Altitude about 1600 ft. Drilled by L & L Drilling Inc., 1972. Cased to 339 ft.

Material	Thickness (ft)	Depth (ft)
Clay; sand	135	135
Basalt, hard, gray	15	150
Basalt, hard, gray	24	174
Basalt, medium, gray	12	186
Basalt, hard, gray	37	223
Basalt, medium, gray	14	237
Basalt, hard, gray	14	251
Clay, yellow	3	254
Basalt, hard, gray	57	311
Clay, black	7	318
Clay, blue; gravel	6	324
Basalt, hard, gray	8	332
Basalt, broken, black	239	571
Basalt, hard, gray	99	670
Clay, black	3	673
Clay; sand, black	27	700
Basalt, hard, gray	210	910
Basalt, broken, black	8	918
Clay, black	2	920
Clay, blue	14	934
Clay, brown	9	943
Sand; basalt, broken, black	11	954
Clay, black	2	956
Clay, brown	7	963
Basalt, medium, brown	20	983

3/16-30F1. Clinton Cosner. Altitude about 1800 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 56 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	15	15
Shale [clay], brown	3	18
Basalt, fractured, gray; clay	8	26
Basalt, gray	6	32
Basalt, fractured; shale [clay]	11	43
Shale, vesicular, brown [basalt, weathered]; clay	8	51
Basalt, fractured, gray	5	56

(continued)

3/16-30F1. Continued.

Material	Thickness (ft)	Depth (ft)
Basalt, gray	46	102
Shale [clay], brown, water-bearing	10	112
Basalt, fractured, gray	21	133
Shale [clay], brown	3	136
Basalt, vesicular, black	5	141
Basalt, vesicular, gray	19	160

3/17-5B1. Emmett Hoctor. Altitude about 1925 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 80 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil; clay	6	6
Shale [clay]; basalt, broken	19	25
Basalt	42	67
Basalt, fractured	4	71
Clay, white	4	75
Clay; cinder [basalt]	3	78
Conglomerate [gravel], water-bearing	48	126
Basalt, fractured	4	130

3/17-5P1. Emmett Hoctor. Altitude about 1960 ft. Drilled by Marion Duft, 1962. Caséd to 52 ft.

Material	Thickness (ft)	Depth (ft)
Gumbo [overburden]	5	5
Clay, yellow	9	14
Rock [basalt], broken	20	34
Clay	16	50
Rock [basalt]	44	94
Basalt, gray	14	108
Rock [basalt], soft, red	10	118
Basalt, gray	62	180

3/17-12P1. Spokane, Portland & Seattle RR. Altitude about 400 ft. Drilled by R. J. Strasser Drilling Company, 1966. Cased to 145 ft.

Material	Thickness (ft)	Depth (ft)
Fill	2	2
Sand; gravel	10	12

(continued)

Material	Thickness (ft)	Depth (ft)
3/17-12P1. Continued.		
Basalt, gray ---------------------	47	59
Lava [basalt], brown -------------	11	70
Basalt, hard, gray ---------------	47	117
Lava [basalt], brown -------------	15	132
Basalt, gray ---------------------	6	138
Basalt, hard, gray ---------------	27	165
Basalt, gray ---------------------	7	172
Lava [basalt], black -------------	22	194
Lava [basalt], broken, some water -	2	196
Basalt, hard, gray ---------------	14	210
Lava [basalt], broken ------------	2	212
Basalt, hard, gray ---------------	102	314
Basalt, black, water-bearing ------	11	325
3/17-15L1. Ray Ferguson. Altitude about 400 ft. Drilled by Gorge Contractors, Inc., 1968. Cased to 40 ft.		
Fill -----------------------------	2	2
Clay, sandy, brown ---------------	13	15
Gravel, coarse; boulders ---------	2	17
Sand, brown ----------------------	7	24
Sand; clay -----------------------	11	35
Clay, blue -----------------------	4	39
Gravel; sand ---------------------	3	42
3/17-20K1. Martin Marietta. Altitude about 460 ft. Drilled by R. J. Strasser Drilling Co., 1971. Cased to 30 ft.		
Fill -----------------------------	27	27
Sand; clay; gravel ---------------	6	33
Rock [basalt], brown -------------	14	47
Basalt, black --------------------	14	61
Basalt, gray ---------------------	12	73
Basalt, dark gray ----------------	81	154
Basalt, dark gray ----------------	44	198
Basalt, porous, black ------------	28	226
Basalt, gray ---------------------	6	232

(continued)

Material	Thickness (ft)	Depth (ft)
3/17-20K1. Continued.		
Basalt, broken, black ------------	12	244
Basalt, black --------------------	5	249
Basalt, broken, black ------------	17	266
Basalt, black --------------------	15	281
Basalt, porous, black ------------	27	308
Basalt, soft, porous -------------	31	339
Basalt, brown and black ----------	12	351
Basalt, hard, gray ---------------	4	355
Basalt, gray ---------------------	17	372
Basalt, porous, black ------------	53	425
Basalt, hard, gray ---------------	62	487
Basalt, very hard, gray ----------	4	491
Basalt, gray ---------------------	32	523
Basalt, porous, black ------------	27	550
Basalt, hard, black --------------	22	572
Basalt, very hard, black ---------	3	575
Basalt, hard, dark gray ----------	4	579
Basalt, dark gray ----------------	37	616
Basalt, black and brown ----------	1	617
Basalt, black --------------------	4	621
Basalt, porous, black ------------	2	623
Basalt, gray ---------------------	31	654
Silt stone -----------------------	29	683
Basalt, gray ---------------------	109	792
Basalt, slightly porous, gray -----	38	830
Basalt, gray ---------------------	15	845
Basalt, broken, dark gray --------	5	850
Basalt, gray ---------------------	8	858
Basalt, broken, gray -------------	20	878
Basalt, gray ---------------------	21	899
Basalt, broken, dark gray --------	24	923
Basalt, hard, gray ---------------	38	961
Basalt, broken, dark gray --------	87	1048
Basalt, dark gray ----------------	40	1088
Basalt, gray ---------------------	40	1128

Material	Thickness (ft)	Depth (ft)
3/17-21A1. Martin Marietta. Altitude about 520 ft. Drilled by R. J. Strasser Drilling Co., 1971. Cased to 23 ft.		
Rock [basalt], fractured ----------	3	3
Basalt, fractured; clay -----------	9	12
Basalt, medium hard, gray ---------	6	18
Basalt, hard, gray ----------------	66	84
Basalt, fractured, brown ----------	20	104
Basalt, hard, gray ----------------	19	123
Basalt, porous, black -------------	7	130
Basalt, hard, gray ----------------	55	185
Basalt, porous, gray --------------	5	190
Basalt, medium hard, gray ---------	9	199
Basalt, porous, gray --------------	5	204
Basalt, medium hard, gray ---------	46	250
Basalt, hard, gray ----------------	76	326
Basalt, fractured, black ----------	8	334
Basalt, medium hard, gray ---------	12	346
Basalt, hard, gray ----------------	56	402
Basalt, fractured, gray -----------	6	408
Basalt, hard, gray ----------------	40	448
Basalt, porous, gray --------------	20	468
Basalt, hard, gray ----------------	30	498
Basalt, porous, gray --------------	6	504
Basalt, porous --------------------		
3/17-29A1. U. S. Corps of Engineers. Altitude about 247 ft. Drilled by R. J. Strasser Drilling Co., 1961. Cased to 301 ft.		
Basalt, rough, gray ---------------	57	57
Flow breccia; basalt, gray --------	18	75
Basalt, medium hard, gray ---------	8	83
Basalt, rough, hard, gray ---------	21	104
Rock [basalt], broken; flow breccia	11	115
Basalt, hard, gray ----------------	3	118
Rock [basalt], soft, gray ---------	10	128
Basalt, hard, gray ----------------	53	181
Basalt, medium hard, black --------	41	222
Basalt, hard, gray ----------------	19	241

(continued)

Material	Thickness (ft)	Depth (ft)
3/17-29A1. Continued.		
Basalt, black ---------------------	15	256
Basalt, hard, black ---------------	5	261
Basalt, rough, hard, gray ---------	26	287
Basalt, hard, gray, caving --------	14	301
Basalt, hard, gray ----------------	4	305
Basalt, medium hard, black --------	21	326
Basalt, vesicular, reddish-brown and black, water-bearing --------	13	339
Basalt, black ---------------------	18	357
Basalt, porous and dense, black ---	64	421
Basalt, porous, black; sediments [clay], water-bearing -----------	24	445
Basalt, hard, black ---------------	14	459
Basalt, hard, gray ----------------	36	495
Basalt, medium hard, black --------	15	510
Basalt, soft, black ---------------	33	543
Basalt, medium hard, black --------	68	611
Basalt, extremely hard, gray ------	88	699
Basalt, black ---------------------	25	724
Basalt, porous, black, water-bearing -----------------------	7	731
Basalt, medium hard, black --------	36	767
Basalt, hard, gray ----------------	2	769
3/18-9N1. Leland Huot. Altitude about 620 ft. Drilled by Marion Duft, 1964. Cased to 109 ft.		
Rock; clay [alluvium] -------------	15	15
Slide rock [talus] ----------------	10	25
Basalt, gray ----------------------	63	88
Clay, blue ------------------------	10	98
Basalt, black ---------------------	18	116
3/19-2A1. C. D. Kelley. Altitude about 1100 ft. Drilled by O'Leary Well Drilling, Inc., 1972.		
Clay, sandy; boulders -------------	25	25
Sand; clay; gravel ----------------	110	135
Shale [clay], brown ---------------	5	140
Basalt, vesicular, gray -----------	70	210
Claystone, brown; clay ------------	100	310

Material	Thickness (ft)	Depth (ft)
3/19-8N1. Alice L. Wesley. Altitude about 1260 ft. Drilled by O'Leary Well Drilling, Inc., 1970. Cased to 20 ft.		
Unknown ----------------------------	192	192
Basalt, vesicular ------------------	21	213
Basalt, fractured ------------------	3	216
Basalt, gray -----------------------	3	219
Basalt, fractured, water-bearing, 6 gpm ----------------------------	1	220
Basalt, gray -----------------------	3	223

Material	Thickness (ft)	Depth (ft)
3/19-29B1. U. S. Corps of Engineers. Altitude about 1060 ft. Drilled by Hansen Drilling Co., Inc., 1974. Cased to 279 ft.		
Soil, sandy, brown -----------------	6	6
Basalt, gray -----------------------	10	16
Basalt, black ----------------------	71	87
Rock [basalt], broken, black and brown ----------------------------	16	103
Rock [basalt], broken, black and green; clay ----------------------	9	112
Rock [clay?], sandy, green and black, cemented in places -------	16	128
Rock [basalt], broken, black; clay	12	140
Basalt, gray -----------------------	109	249
Basalt, greenish-gray --------------	8	257
Rock [basalt], broken, brown, black and gray ------------------	4	261
Basalt, gray -----------------------	12	273
Lava rock [basalt], black ----------	10	283
Basalt, black ----------------------	2	285

Material	Thickness (ft)	Depth (ft)
3/20-7F1. Horace White. Altitude about 830 ft. Drilled by H. T. Leonard, 1954. Cased to 39 ft.		
Soil -------------------------------	15	15
Rock [basalt], broken --------------	35	50
Basalt, broken, black --------------	40	90

(continued)

Material	Thickness (ft)	Depth (ft)
3/20-7F1. Continued.		
Basalt, soft, gray, 150 gpm, SWL 20'	14	104
Basalt, red ------------------------	11	115
Clay, yellow -----------------------	6	121
Clay, green ------------------------	2	123
Basalt, soft, broken ---------------	16	139
Basalt, hard, gray -----------------	31	170
Basalt, soft, gray -----------------	13	183
Basalt, hard, gray -----------------	25	208
Basalt, soft, black ----------------	12	220
Basalt, soft, black ----------------	11	231
Basalt, hard, black ----------------	3	234
Basalt, red ------------------------	22	256
Clay, yellow -----------------------	2	258
Basalt, soft, black ----------------	6	264
Basalt, hard, black ----------------	1	265

Material	Thickness (ft)	Depth (ft)
3/20-21Q2. Sundale Orchards, Inc. Altitude about 307 ft. Drilled by Duft Drilling Co., 1964. Deepened by Storey Drilling Co., 1964. Cased to 70 ft.		
Sand; gravel -----------------------	20	20
Sand; gravel, show of water --------	37	57
Basalt -----------------------------	168	225
Crevice water [basalt, fractured, water-bearing] ------------------	2	227
Basalt, gray -----------------------	12	239
Basalt -----------------------------	11	250
Basalt, hard, gray -----------------	1	251
Lava, rock [basalt], red, water-bearing -------------------------	19	270
Basalt, hard, gray -----------------	2	272

Material	Thickness (ft)	Depth (ft)
3/21-9L1. U. S. Corps of Engineers. Altitude about 280 ft. Drilled by Charles Jungmann Drilling Co., 1966. Cased to 65 ft.		
Gravel; clay -----------------------	2	2
Basalt, broken, brown --------------	2	4

(continued)

Material	Thickness (ft)	Depth (ft)
3/21-9L1. Continued.		
Basalt, gray	11	15
Basalt, black	34	49
Basalt, broken	13	62
Basalt, black	30	92
Basalt, hard, gray	84	176
Basalt, soft, black, SWL 176'	15.5	191.5
3/21-9N1. North Roosevelt Water Assn. Altitude about 280 ft. Drilled by Marion Duft, 1961. Cased to 24 ft.		
Topsoil	2	2
Rock [basalt], broken	2	4
Basalt, hard, gray	51	55
Basalt, soft, porous, black	10	65
Basalt, hard, black	16	81
3/21-17F1. City of Roosevelt. Altitude about 350 ft. Drilled by Storey Drilling Co., 1961. Cased to 50 ft.		
Soil	2	2
Basalt, gray	5	7
Basalt, fractured, gray	3	10
Basalt, gray	55	65
Basalt, broken	10	75
Basalt, gray	55	130
Basalt, broken, brown	10	140
Basalt, hard, gray	30	170
Basalt, hard, gray	20	190
Basalt, black; shale [clay]	10	200
Basalt, broken, black, water-bearing	23	223
3/21-18J1. Norm Goree. Altitude about 370 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 64 ft.		
Unknown	186	186
Basalt, vesicular, black	17	203

(continued)

Material	Thickness (ft)	Depth (ft)
3/21-18J1. Continued.		
Basalt, gray	21	224
Basalt, vesicular, gray	26	250
4/10-11A1. Orlis G. Hale. Altitude about 900 ft. Drilled by Hansen Drilling Co., Inc., 1967. Cased to 137 ft.		
Topsoil	1	1
Clay, red and brown	8	9
Sand; clay; gravel	3	12
Rock [basalt], medium soft, deteriorated, gray	4	16
Rock [basalt], medium hard, gray	8	24
Sand; clay; gravel	2	26
Rock [basalt], medium, reddish-gray	3	29
Rock [basalt], medium hard, gray	5	34
Rock [basalt], broken, medium, gray	2	36
Rock [basalt], medium, gray	22	58
Soil [clay], sandy, brown	7	65
Rock [basalt], broken	9	74
Rock [basalt], blue-black	6	80
Rock [basalt], broken, brown	12	92
Rock [basalt], broken, blue-black	47	139
4/10-11H2. E. W. Krall. Altitude about 700 ft. Drilled by George Zent and Sons, 1947. Cased to 70 ft.		
Soil	1	1
Clay	6	7
Clay, sandy	63	70
Lava rock [basalt]	2	72
4/10-12M1. Carl Belding. Altitude about 690 ft. Drilled by Hansen Drilling Co., Inc., 1969. Cased to 105 ft.		
Topsoil	3	3
Clay; boulders	5	8
Clay, sandy, brown	5	13

(continued)

Material	Thickness (ft)	Depth (ft)
4/10-12M1. Continued.		
Rock [basalt], decomposed ---------	2	15
Rock [basalt], medium, gray -------	17	32
Rock [basalt], soft, gray-brown ---	3	35
Rock [basalt], medium hard, gray --	28	63
Rock [basalt], soft, gray ---------	3	66
Rock [basalt], medium hard, gray --	34	100
Broken sponge-like rock [basalt, vesicular] ---------------------	5	105
4/10-13G1. Eugene C. Morris. Altitude about 600 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 37 ft.		
Clay, brown ----------------------	15	15
Clay, brown ----------------------	20	35
Basalt, vesicular; clay -----------	2	37
Basalt, gray ---------------------	14	51
Basalt, vesicular; clay -----------	22	73
Basalt, vesicular; clay -----------	12	85
4/10-13H1. Cora Rayburn. Altitude about 520 ft. Drilled by George Zent and Sons, 1964. Cased to 96 ft.		
Clay, rocky ----------------------	23	23
Clay, sandy ----------------------	15	38
Lava rock [basalt] ----------------	42	80
Silt [clay], black ----------------	8	88
Lava rock [basalt] ----------------	15	103
4/10-13Q2. Arthur F. Moore. Altitude about 580 ft. Drilled by George Zent and Sons, 1956. Cased to 188 ft.		
Clay, sandy ----------------------	8	8
Basalt, gray ---------------------	36	44
Clay, blue -----------------------	3	47
Clay, sandy, gray -----------------	15	62
Rock [basalt]; sand; gravel -------	22	84
Rock [basalt], broken, black ------	88	172

(continued)

Material	Thickness (ft)	Depth (ft)
4/10-13Q2. Continued.		
Basalt, gray ----------------------	28	200
Rock [basalt], fractured ----------	25	225
Shale [clay], green ---------------	30	255
4/10-24J1. Bob Jarvis. Altitude about 540 ft. Drilled by Triangle Drilling Inc., 1974. Cased to 81 ft.		
Sand, fine, tan -------------------	39	39
Sand, fine, gray ------------------	6	45
Clay, gray ------------------------	15	60
Sand, medium fine, gray -----------	7	67
Basalt, black ---------------------	26	93
4/10-25H4. Claude Black. Altitude about 440 ft. Drilled by Swift Water Well Drilling, Inc., 1973. Cased to 54 ft.		
Soil, sandy, dark brown -----------	5	5
Clay, sandy, brown ----------------	3	8
Clay, brown -----------------------	8	16
Clay, sandy, moist, blue ----------	32	48
Basalt, hard, black ---------------	7	55
Basalt, fractured, black ----------	5	60
Basalt, hard, black ---------------	10	70
Basalt, fractured, black ----------	10	80
4/10-36G1. David Gibney. Altitude about 480 ft. Drilled by Swift Water Well Drilling, Inc., 1973. Cased to 113 ft.		
Soil, sandy, brown ----------------	6	6
Sand, medium, brown ---------------	87	93
Clay, moist, blue -----------------	5	98
Gravel, water-bearing -------------	22	120

Material	Thickness (ft)	Depth (ft)
4/10-36N1. Clem Clark. Altitude about 450 ft. Drilled by Swift Water Well Drilling, Inc., 1973. Cased to 40 ft.		
Clay, dark brown ------------------	8	8
Clay, dark brown ------------------	18	26
Clay, medium, sandy, moist, brown -	6	32
Sand, fine, moist, brown ----------	3	35
Basalt, fractured, black ----------	10	45
Basalt, hard, black ---------------	5	50
Basalt, fractured, black, water-bearing ------------------------	20	70
Basalt, hard, black ---------------	2	72
Basalt, fractured and weathered, black, water-bearing, 12 gpm ----	3	75
4/11-6P1. E. L. Jones. Altitude about 1320 ft. Drilled by George Zent and Sons, 1965. Cased to 20 ft.		
Soil ------------------------------	4	4
Gravel ----------------------------	2	6
Boulders --------------------------	10	16
Rock [basalt] ---------------------	37	53
Clay, sandy, brown ----------------	2	55
Rock [basalt], soft ---------------	2	57
Clay, sandy, red ------------------	5	62
Clay, sandy, brown ----------------	96	158
4/11-8J1. 3 JB Ranch. Altitude about 2000 ft. Drilled by Swift Water Well Drilling, Inc., 1973. Cased to 28 ft.		
Clay, medium, dark brown; cobbles -	3	3
Clay, red; gravel -----------------	19	22
Basalt, red-brown -----------------	21	43
Basalt, hard, fractured, black ----	47	90
Basalt, hard, light gray ----------	190	280

Material	Thickness (ft)	Depth (ft)
4/11-19J1. J. S. Paradis. Altitude about 840 ft. Drilled by Swift Water Well Drilling, Inc., 1974. Cased to 119 ft.		
Topsoil ---------------------------	1	1
Cinders [basalt, vesicular], red --	107	108
Rock [basalt], red ----------------	39	147
Basalt, black ---------------------	33	180
Basalt, hard, gray ----------------	220	400
Basalt, fractured, gray, water-bearing ------------------------	30	430
Basalt, fractured, gray, water-bearing ------------------------	10	440
4/11-23P1. Leland Wiley. Altitude about 2020 ft. Drilled by Thomas L. Leonard, 1974. Cased to 59 ft.		
Topsoil ---------------------------	7	7
Soil; boulders --------------------	3	10
Rock [basalt], soft, light gray ---	20	30
Rock [basalt], medium, light tan --	17	47
Clay, tan -------------------------	4	51
Clay, yellow; gravel --------------	9	60
Basalt, black ---------------------	13	73
Clay, yellow; gravel --------------	2	75
Basalt, hard, gray ----------------	7	82
4/11-24L1. Kevin Smith. Altitude about 2200 ft. Drilled by Richard J. Murray, 1975. Cased to 32 ft.		
Soil ------------------------------	5	5
Clay, gray ------------------------	4	9
Sandstone, gray -------------------	17	26
Clay, brown -----------------------	6	32
Basalt, hard, gray ----------------	7	39
Basalt, soft, black ---------------	15	54
Basalt, hard, gray ----------------	187	241
Basalt, vesicular, black ----------	44	285

4/11-31E1. Husum Hills Golf Club. Altitude about 500 ft. Drilled by George Zent and Sons, 1965. Cased to 144 ft.

Material	Thickness (ft)	Depth (ft)
Clay, silty, brown	15	15
Clay, sandy, blue	53	68
Clay, sandy, gray-brown	16	84
Rock [basalt], broken; clay	12	96
Rock [basalt], broken, water-bearing	11	107
Gravel, partially cemented, water-bearing, 10 gpm	6	113
Clay, sandy, brown	21	134
Gravel, cemented	28	162

4/12-9A1. Delbert Blackburn. Altitude about 2320 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 19 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	4	4
Basalt, gray	56	60
Basalt, fractured, gray	3	63
Basalt, vesicular, black; clay	13	76
Basalt, fractured; sand	5	81
Basalt, fractured, gray	4	85

4/12-10G1. Gerald Darby. Altitude about 2400 ft. Drilled by Brian Blocker, 1974. Cased to 18 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	1	1
Clay, hard, brown	7	8
Basalt, hard, gray	36	44
Basalt, fractured, black	9	53
Basalt, hard, gray	18	71
Basalt, fractured, black, water-bearing	9	80

4/12-10J1. F. B. Augee. Altitude about 2420 ft. Drilled by Swift Water Well Drilling, Inc., 1974. Cased to 20 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	1	1
Clay, brown	9	10

(continued)

4/12-10J1. Continued.

Material	Thickness (ft)	Depth (ft)
Clay, brown	5	15
Basalt, fractured, black	12	27
Basalt, hard, black	8	35
Basalt, fractured, black	5	40
Basalt, hard, black	220	260
Basalt, fractured, black	40	300

4/12-10R1. Lawrence Milgrove. Altitude about 2420 ft. Drilled by Swift Water Well Drilling, Inc., 1974. Cased to 18 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	1	1
Clay, hard, brown	6	7
Basalt, hard, gray	243	250
Basalt, fractured, black	46	296
Basalt, hard, gray	17	313
Basalt, fractured, black	18	331
Basalt, hard, gray	67	398
Basalt, fractured, black	9	407
Basalt, hard, gray	3	410

4/12-21Q1. Lolla Loftis. Altitude about 2560 ft. Drilled by Richard J. Murray, 1975. Cased to 62 ft.

Material	Thickness (ft)	Depth (ft)
Soil	2	2
Boulders; rock, broken; soil	13	15
Basalt, dark brown	14	29
Basalt, hard, gray	12	41
Basalt, soft, brown, SWL 55'	21	62
Basalt, hard, gray	68	130
Basalt, black, water-bearing	30	160
Basalt, hard, gray	45	205

4/12-22R1. Willis H. Maxson. Altitude about 2440 ft. Drilled by Swift Water Well Drilling, Inc., 1974. Cased to 69 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	2	2

(continued)

4/12-22R1. Continued.

Material	Thickness (ft)	Depth (ft)
Clay, sandy, brown	23	25
Clay, brown; boulders	20	45
Clay, sandy, brown	17	62
Basalt, decomposed, water-bearing	5	67
Basalt, fractured, black, water-bearing	13	80

4/12-23P1. Mel Tennison. Altitude about 2330 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 29 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	3	3
Clay, brown	26	29
Basalt, gray	11	40
Basalt, fractured, gray	3	43
Conglomerate [gravel]; clay, water-bearing	25	68
Basalt, fractured, gray	7	75

4/12-24P1. Edward Fousel. Altitude about 2300 ft. Drilled by Murray Well Drilling, 1975. Cased to 56 ft.

Material	Thickness (ft)	Depth (ft)
Soil	8	8
Conglomerate [gravel]	37	45
Boulders	5	50
Basalt, gray	91	141
Basalt, vesicular, black	26	167
Basalt, brown	8	175
Basalt, black	45	220
Basalt, gray, no water encountered	40	260

4/13-12A1. Steven Drew. Altitude about 1800 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 40 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown; boulders	28	28
Clay, water-bearing	12	40
Basalt, fractured	117	157
Basalt, vesicular, black; clay	8	165
Basalt, gray	65	230

4/13-12C1. Lyle Long. Altitude about 1800 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 18 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown; boulders	18	18
Basalt, gray	139	157
Basalt, fractured, water-bearing	23	180

4/13-22P1. H. L. Vogt. Altitude about 450 ft. Driller unknown, 1964. Cased to 49 ft.

Material	Thickness (ft)	Depth (ft)
Soil; boulders	11	11
Clay, yellow	2	13
Clay, red; boulders	15	28
Gravel; clay, trace of water	8	36
Basalt, gray	3	39
Clay, brown	2	41
Basalt, gray	4	45
Gravel, trace of water	1	46
Basalt, broken, blue	4	50
Basalt, blue	36	86
Basalt, brown	2	88
Basalt, porous, black	8	96

4/13-28G1. Kenith Vogt. Altitude about 760 ft. Drilled by Marion Duft, 1964. Cased to 82 ft.

Material	Thickness (ft)	Depth (ft)
Clay	20	20
River rock [gravel]	2	22
Basalt, gray	30	52
Sand	1	53
Basalt, gray	29	82
Bedrock [basalt]	51	133

4/14-1M1. Ken Sipe. Altitude about 1530 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 155 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown; boulders	13	13
Basalt, gray	27	40
Clay, brown	3	43

(continued)

Material	Thickness (ft)	Depth (ft)
4/14-1M1. Continued.		
Clay, brown; gravel --------------	6	49
Basalt, vesicular, gray; clay -----	32	81
Shale [clay], brown --------------	11	92
Basalt, fractured, gray ----------	4	96
Basalt, gray --------------------	9	105
Sandstone, brown -----------------	3	108
Clay, brown; gravel --------------	27	135
Shale [clay], brown --------------	17	152
Basalt, vesicular, black; clay ----	33	185
Basalt, gray --------------------	105	290
Basalt, vesicular, black; clay ----	12	302
Basalt, gray --------------------	4	306
Basalt, vesicular, gray ----------	8	314
Basalt, vesicular, black; clay ----	18	332
Claystone, blue ------------------	5	337
Basalt, vesicular, gray ----------	9	346
Basalt, fractured, gray ----------	7	353
Basalt, fractured, brown ---------	3	356
Basalt, brown -------------------	5	361
Basalt, gray --------------------	149	510
Basalt, fractured ----------------	15	525
Basalt, vesicular, gray ----------	8	533
Basalt, black -------------------	2	535
Basalt, fractured, gray ----------	4	539
Sandstone, hard, gray ------------	5	544
Basalt, gray --------------------	13	557
Basalt, vesicular, gray ----------	5	562
Basalt, fractured, brown ---------	3	565
4/14-17F1. W. F. Kirchner. Altitude about 590 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 23 ft.		
Clay ----------------------------	16	16
Clay; gravel, coarse; boulders ----	4	20
Basalt, hard, gray ---------------	34	54
Basalt, water-bearing ------------	1	55
Basalt, hard, gray ---------------	5	60

Material	Thickness (ft)	Depth (ft)
4/14-21C1. Leroy Van Belle. Altitude about 1360 ft. Deepened by O'Leary Well Drilling, Inc., 1973. Cased to 74 ft.		
Topsoil -------------------------	3	3
Sand, dry -----------------------	42	45
Silt, gray, damp ----------------	30	75
Basalt, hard --------------------	62	137
Basalt, fractured ----------------	7	144
Claystone, brown -----------------	2	146
Basalt --------------------------	139	285
Basalt, fractured ----------------	23	308
Basalt; clay --------------------	46	354
Basalt --------------------------	18	372
Basalt, gray --------------------	3	375
Cinder [basalt] ------------------	11	386
Basalt, fractured, vesicular ------	94	480
Basalt, fractured, vesicular; clay	234	714
Basalt, gray --------------------	223	937
Basalt, gray; clay ---------------	13	950
Basalt, gray --------------------	5	955
4/14-23L1. Wash. Investment. Altitude about 1580 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 5 ft.		
Topsoil -------------------------	4	4
Basalt, vesicular ----------------	44	48
Basalt, gray --------------------	27	75
Clay ----------------------------	15	90
Shale [clay] --------------------	12	102
Basalt, fractured ----------------	50	152
Cinder [basalt], red -------------	23	175
Basalt, vesicular ----------------	62	237
Basalt, black -------------------	5	242
Basalt, vesicular ----------------	26	268
Basalt, black -------------------	42	310
4/14-26K1. Raymond Humphrey. Altitude about 1560 ft. Drilled by Gorge Contractors Inc., 1970. Cased to 138 ft.		
Topsoil -------------------------	3	3

(continued)

Material	Thickness (ft)	Depth (ft)
4/14-26K1. Continued.		
Basalt, vesicular; clay -----------	53	56
Basalt, vesicular ----------------	43	99
Clay, soft, white ----------------	3	102
Basalt, vesicular ----------------	28	130
Clay, soft, brown ----------------	4	134
Basalt, vesicular, gray -----------	6	140
Basalt, hard ---------------------	21	161
Basalt, fractured ----------------	4	165
Basalt, vesicular, water-bearing --	25	190
Basalt, gray ---------------------	5	195

4/15-1Q1. Eugene H. Amidon. Altitude about 1750 ft. Drilled by O'Leary Well Drilling, Inc., 1970. Cased to 80 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil --------------------------	3	3
Clay; boulders -------------------	10	13
Basalt, gray ---------------------	36	49
Basalt, fractured; clay -----------	2	51
Clay, red and brown --------------	12	63
Claystone, brown -----------------	13	76
Basalt, fractured; clay -----------	3	79
Claystone, brown -----------------	2	81
Basalt, vesicular; clay -----------	18	99
Basalt, fractured ----------------	2	101
Basalt, vesicular ----------------	24	125
Lava [basalt], hard, gray ---------	5	130

4/15-2N2. Emmet E. Clouse. Altitude about 1680 ft. Drilled by Gorge Contractors, Inc., 1968. Cased to 66 ft.

Material	Thickness (ft)	Depth (ft)
Loam; sand; clay -----------------	6	6
Gravel, coarse; boulders; clay ----	9	15
Basalt ---------------------------	25	40
Cinders [basalt], soft, red -------	25	65
Basalt ---------------------------	35	100
Basalt, gray ---------------------	10	110
Basalt, red ----------------------	17	127
Basalt, gray ---------------------	55	182

(continued)

Material	Thickness (ft)	Depth (ft)
4/15-2N2. Continued.		
Basalt, red ----------------------	42	224
Basalt ---------------------------	64	288
Basalt, fractured, water-bearing, 30 gpm ------------------------	8	296
Basalt, hard ---------------------	20	316
Basalt ---------------------------	19	335
Basalt, fractured, water-bearing, 18 gpm ------------------------	12	347
Basalt, hard ---------------------	18	365
Basalt, fractured, water-bearing, 90 gpm ------------------------	5	370
Basalt, hard ---------------------	22	392
Basalt, gray, water-bearing, 12 gpm	18	410

4/15-3H1. A. Winterstein. Altitude about 1725 ft. Drilled by Riebe Well Drilling, 1968. Cased to 133 ft.

Material	Thickness (ft)	Depth (ft)
Soil, hard, sandy ----------------	18	18
Basalt, broken, brown; clay; boulders -----------------------	23	41
Basalt, very hard, gray ----------	41	82
Rock [basalt], water-bearing ------	40	122
Basalt, gray ---------------------	20	142
Cinders [basalt], black and red ---	20	162
Basalt, broken -------------------	48	210
Basalt, gray ---------------------	37	247
Rock [basalt], broken; clay; boulders, water-bearing ------------	50	297
Basalt, gray ---------------------	23	320
Clay; boulders, water-bearing -----	20	340
Basalt, gray ---------------------	20	360
Basalt, porous -------------------	6	366
Basalt, gray; clay ----------------	28	394
Lava [basalt], broken ------------	4	398
Basalt, gray ---------------------	8	406
Basalt, porous; clay, water-bearing	8	414
Basalt, gray ---------------------	1	415

Material	Thickness (ft)	Depth (ft)
4/15-4F1. Ed Doubravsky. Altitude about 1760 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 19 ft.		
Clay, brown	4	4
Basalt, gray	44	48
Basalt, vesicular	15	63
Basalt, gray	39	102
Gravel; clay	13	115
Basalt, vesicular, gray	15	130
4/15-4R1. George Andrews. Altitude about 1680 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 19 ft.		
Clay	4	4
Boulders	4	8
Void [clay?]	5	13
Basalt, gray	3	16
Basalt, fractured, gray	1	17
Basalt, fractured, gray	33	50
Basalt, fractured, gray; clay	5	55
Clay	6	61
Cinders and lava [basalt]; clay, water-bearing	6	67
Conglomerate [gravel]; sand; clay	3	70
Clay, brown	18	88
Basalt, fractured, vesicular; shale [clay]	13	101
Basalt, fractured, black	16	117
Cinders and lava [basalt]; clay, water-bearing	3	120
Sandstone, gray	8	128
Basalt, gray	2	130
4/15-5J1. Dale Thiele. Altitude about 1710 ft. Drilled by Riebe Well Drilling, 1967. Cased to 58 ft.		
Soil, clayey	4	4
Rock [basalt], red; clay	43	47
Basalt, broken, porous	59	106

(continued)

Material	Thickness (ft)	Depth (ft)
4/15-5J1. Continued.		
Basalt, gray	23	129
Rock [basalt], hard, red	8	137
Basalt, gray	16	153
Rock [basalt], red, water-bearing	14	167
Basalt, gray	31	198
Rock [basalt], red, water-bearing	14	212
Basalt, broken, porous, black; clay	110	322
Lava [basalt], blue, black; clay	18	340
Clay, blue; sand, water-bearing, 300 gpm	27	367
Lava [basalt], porous, black; clay	15	382
4/15-6A1. Howard Bratton. Altitude about 1680 ft. Drilled by O'Leary Well Drilling, Inc., 1974.		
Unknown	209	209
Basalt, gray	2	211
Basalt, fractured; clay	36	247
Basalt, fractured, vesicular; clay	335	582
Clay, green	10	592
Silt, sandy, water-bearing	3	595
4/15-8G1. Earl McClintock. Altitude about 1650 ft. Drilled by 4 Star Drilling Company, 1969. Cased to 15 ft.		
Soil	15	15
Basalt, hard	10	25
Basalt, hard	15	40
Basalt, medium	15	55
Basalt, medium	15	70
Basalt, medium	15	85
Basalt, medium, water-bearing	15	100
Clay	15	115
Clay	15	130
Red rock [basalt], medium	15	145
Basalt, medium	15	160
Basalt, medium	15	175
Basalt, medium	15	190
Basalt, medium	15	205

(continued)

Material	Thickness (ft)	Depth (ft)
4/15-8G1. Continued.		
Basalt, medium	15	220
Basalt, medium	15	235
Basalt, medium	15	250
Basalt, medium	15	265
Basalt, water-bearing	15	280
Basalt, medium	15	295
Basalt, medium	15	310
Basalt, medium	15	325
Basalt, medium	15	340
Basalt, medium	15	355

4/15-9G1. Ray Hill. Altitude about 1620 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 27 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	8	8
Basalt, gray	11	19
Basalt, vesicular, gray	3	22
Basalt, gray	9	31
Basalt, vesicular, gray and black; clay, water-bearing	61	92
Clay, green	10	102
Basalt, vesicular, fractured, gray	43	145

4/15-10F1. George Beebe. Altitude about 1660 ft. Drilled by Hansen Drilling Co., Inc., 1969. Cased to 383 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	5	5
Clay, brown	11	16
Rock [basalt], black; clay [interbedded]	34	50
Rock [basalt], soft; clay, water-bearing	40	90
Rock [basalt], medium hard, water-bearing	60	150
Basalt, medium hard, gray	100	250
[Basalt], black, water-bearing	10	260
Rock [basalt]	85	345

(continued)

Material	Thickness (ft)	Depth (ft)
4/15-10F1. Continued.		
Rock [basalt], medium, soft, broken, black, water-bearing	33	378
Rock [basalt], hard, gray	36	414
Rock [basalt], broken, gray, water-bearing	36	450

4/15-11K1. Wash. Dept. of Game. Altitude about 1640 ft. Drilled by O'Leary Well Drilling, Inc., 1970. Cased to 184 ft.

Material	Thickness (ft)	Depth (ft)
Basalt, fractured; clay	28	28
Basalt, gray	16	44
Basalt, fractured; clay	17	61
Cinder [basalt]; clay	6	67
Basalt, vesicular, gray	27	94
Cinder [basalt]; clay	14	108
Basalt, vesicular, gray	20	128
Conglomerate [gravel]; clay	56	184
Basalt, fractured, gray	28	212
Claystone, green and brown	2	214
Basalt, fractured, gray	54	268
Claystone, green	3	271
Basalt, vesicular, fractured, brown, water-bearing	63	334
Basalt, gray	1	335

4/15-15H2. Ross Wilkins. Altitude about 1630 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 76 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	2	2
Sandstone, gray	29	31
Sandstone, gray; clay	11	42
Sandstone, gray	11	53
Sandstone, gray; clay	9	62
Sandstone, brown; clay	13	75
Sandstone, gray	90	165
Basalt, vesicular, gray	6	171
Sandstone, gray	52	223

(continued)

Material	Thickness (ft)	Depth (ft)
4/15-15H2. Continued.		
Basalt, gray	9	232
Basalt, vesicular, gray	17	249
Sandstone, gray; clay	6	255
Basalt, vesicular, gray	5	260
Basalt, fractured, gray	6	266
Basalt, vesicular, gray; clay	6	272
Basalt, fractured, gray	16	288
Sandstone, brown; clay	6	294
Sandstone, gray; clay	1	295

4/15-16F1. Wash. Dept. of Natural Res. Altitude about 1595 ft. Drilled by L & L Drilling, Inc., 1970. Cased to 331 ft.

Material	Thickness (ft)	Depth (ft)
Boulders; soil	19	19
Basalt, hard, water-bearing	27	46
Basalt, broken	60	106
Basalt, medium hard; clay, interbedded	101	207
Basalt, hard	8	215
Basalt, medium	30	245
Basalt, hard	4	249
Basalt, medium	35	284
Cavey formation [interflow zone], water-bearing	47	331
Basalt, hard; clay	49	380
Cinders [basalt], red	16	396
Basalt, hard	94	490
Basalt, hard	46	536
Basalt, hard	54	590
Clay, sticky, water-bearing	5	595

4/15-21F1. Lloyd Hutchins. Altitude about 1600 ft. Drilled by Gorge Contractors, Inc., 1968. Cased to 27 ft.

Material	Thickness (ft)	Depth (ft)
Clay; boulders	5	5
Lava [basalt], brown	13	18
Clay, red	8	26
Basalt	22	48
Cinders [basalt], red	5	53

(continued)

Material	Thickness (ft)	Depth (ft)
4/15-21F1. Continued.		
Lava [basalt], brown; shale [clay]	117	170
Clay, red	2	172
Lava [basalt], black	15	187
Basalt	45	232

4/15-23E1. B. F. Dunn. Altitude about 1620 ft. Drilled by 4 Star Drilling Co., 1970. Cased to 10 ft.

Material	Thickness (ft)	Depth (ft)
Soil	9	9
Basalt, hard	16	25
Basalt, medium	15	40
Rock [basalt], red	15	55
Basalt, medium, water-bearing	90	145
Sand	45	190

4/15-26B1. Inez Holdridge. Altitude about 1510 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 52 ft.

Material	Thickness (ft)	Depth (ft)
Clay; boulders	17	17
Basalt	14	31
Clay	16	47
Basalt, vesicular	9	56
Basalt, gray and brown	180	236
Basalt, vesicular, fractured	20	256
Basalt, black and gray	26	282
Basalt, gray	13	295

4/15-26H1. George Keech. Altitude about 1580 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 35 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	12	12
Clay, brown	2	14
Clay, brown	6	20
Claystone, brown	5	25
Basalt, vesicular, fractured; clay	11	36
Basalt, fractured, gray	17	53

(continued)

4/15-26H1. Continued.

Material	Thickness (ft)	Depth (ft)
Basalt, fractured, gray, water-bearing	2	55
Basalt, gray	37	92
Basalt, fractured	8	100
Basalt, gray	60	160
Basalt, fractured	5	165
Basalt, gray	36	201
Basalt, fractured	3	204
Basalt, gray	26	230
Basalt, vesicular, gray; shale [clay]	10	240
Basalt, fractured	5	245
Basalt, fractured; clay	6	251
Basalt, fractured	10	261
Basalt, fractured; clay	3	264
Basalt, fractured	11	275
Basalt, gray	25	300

4/15-26R2. George Keech. Altitude about 1660 ft. Drilled by O'Leary Well Drilling, Inc., 1970. Cased to 117 ft.

Material	Thickness (ft)	Depth (ft)
Shale [clay]; boulders	20	20
Clay, brown	30	50
Clay; basalt	38	88
Basalt, fractured; clay	17	105
Conglomerate [gravel]; clay, water-bearing	15	120
Basalt, fractured	5	125

4/15-27J1. Skip Corsey. Altitude about 1620 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 57 ft.

Material	Thickness (ft)	Depth (ft)
Clay; boulders	2	2
Basalt, gray	39	41
Clay, brown, green and black	11	52
Basalt, gray	139	191
Basalt, fractured, gray, water-bearing	1	192
Basalt, gray	13	205

4/15-31D1. Ken Anderson. Altitude about 1760 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 81 ft.

Material	Thickness (ft)	Depth (ft)
Clay	71	71
Basalt, gray	95	166
Basalt, fractured, water-bearing	1	167
Basalt, black	31	198
Basalt, vesicular, gray, water-bearing	3	201
Basalt, gray	217	418
Basalt, vesicular, gray, water-bearing	4	422
Basalt, gray	8	430

4/15-32R2. Charles Eshelman. Altitude about 1800 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 52 ft.

Material	Thickness (ft)	Depth (ft)
Clay; boulders	35	35
Basalt, gray	4	39
Clay, green	13	52
Basalt, gray	61	113
Basalt, fractured, water-bearing	22	135
Basalt	115	250

4/15-35E1. Earl McClintock. Altitude about 1740 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 73 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	46	46
Basalt, gray	22	68
Clay, brown	1	69
Basalt, gray	14	83
Basalt, fractured; shale, [clay], water-bearing	32	115

4/16-6A1. Roger Pond. Altitude about 1920 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 34 ft.

Material	Thickness (ft)	Depth (ft)
Clay; boulders	8	8
Clay; cinder [basalt]	21	29
Sandstone, gray; clay; cinder [basalt]	290	319
Sandstone, gray; clay	9	328
Cinder [basalt]	12	340

4/16-8G1. Pat McEwen. Altitude about 1800 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 28 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	4	4
Clay	14	18
Lava [basalt], gray	5	23
Sandstone, gray	59	82
Lava [basalt], gray	75	157
Basalt	11	168
Lava [basalt], vesicular, gray; clay	85	253
Sandstone	3	256
Basalt, vesicular, water-bearing	17	273
Cinder [basalt], red	27	300

4/16-9D1. E. M. Foster. Altitude about 1820 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 19 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	8	8
Shale [clay], brown	11	19
Basalt, gray	24	43
Claystone, brown; sand	28	71
Basalt, vesicular, gray, water-bearing	6	77
Basalt, vesicular, fractured, red	14	91
Clay, brown	4	95
Sandstone, gray; basalt, vesicular	76	171
Basalt, gray	29	200

4/16-10B3. Dick Ladiges. Altitude about 1800 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 23 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	8	8
Basalt, gray	8	16
Clay, brown	6	22
Basalt, vesicular, gray	8	30
Basalt, vesicular, gray; clay	8	38
Basalt, vesicular, brown; clay	3	41
Basalt, fractured, gray; clay	8	49
Basalt, vesicular, gray	21	70
Basalt, gray	164	234
Sandstone, red	13	247
Sandstone, brown	7	254
Basalt, black	9	263
Basalt, gray	23	286
Basalt, black	11	297
Clay, green	1	298
Basalt, vesicular, black	16	314
Basalt, black	11	325
Basalt, gray	65	390
Claystone, green	7	397
Claystone, green; basalt, vesicular	3	400
Basalt, gray	3	403
Basalt, vesicular, black, water-bearing	4	407
Basalt, gray	8	415

4/16-10L1. Charles Koenig. Altitude about 1700 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 19 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	1	1
Shale, [clay], gray	3	4
Basalt, fractured, gray	6	10
Basalt, gray	28	38
Basalt, vesicular, fractured	13	51
Clay, brown	7	58
Basalt, fractured; shale [clay]	16	74
Basalt, fractured, gray	35	109
Basalt, vesicular, black	6	115

Material	Thickness (ft)	Depth (ft)
4/16-11D2. C. M. Barrett. Altitude about 1880 ft. Drilled by Gorge Contractors, Inc., 1970. Cased to 26 ft.		
Gravel	15	15
Clay, yellow and brown	8	23
Clay	2	25
Basalt, vesicular	22	47
Basalt, vesicular; clay	3	50
Basalt, vesicular, gray	56	106
Claystone, red	1	107
Basalt, vesicular, gray	13	120
Basalt, gray	70	190
Basalt, vesicular, gray	11	201
Basalt, hard	3	204
Claystone, black	1	205
Claystone, green	3	208
Basalt, vesicular, black, water-bearing	12	220
Basalt, hard, gray	156	376
Basalt, fractured; clay	12	388
Sandstone, blue-green, water-bearing	3	391
Basalt, vesicular, porous, black; clay	12	403
Basalt, vesicular, black	17	420
4/16-11J1. Dale Reimer. Altitude about 2140 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 29 ft.		
Clay, brown	6	6
Boulders; clay	4	10
Clay, brown	4	14
Sandstone, brown	5	19
Clay, brown	5	24
Basalt, heavy, fractured	3	27
Basalt, gray	7	34
Basalt, vesicular, gray; clay; sand	4	38
Basalt, vesicular, brown	10	48
Basalt, vesicular, gray; clay	18	66
Basalt, gray	13	79

(continued)

Material	Thickness (ft)	Depth (ft)
4/16-11J1. Continued.		
Basalt, vesicular; clay	4	83
Basalt, vesicular, gray	11	94
Basalt, vesicular; clay	3	97
Basalt, vesicular, red; sand; clay	4	101
Basalt, gray	6	107
Basalt, vesicular, gray	4	111
Basalt, vesicular, gray; clay	6	117
Basalt, vesicular, gray	9	126
Basalt, fractured, gray; clay	3	129
Clay, sandy, brown	14	143
Clay, light brown	27	170
Claystone, white	7	177
Sandstone, brown; clay	15	192
Sandstone, green; clay	24	216
Sandstone, green; clay	4	220
Clay, green	38	258
Shale [clay], brown	7	265
Basalt, gray	47	312
Basalt, vesicular, gray	15	327
Basalt, gray	7	334
Basalt, vesicular, gray	11	345
Basalt, gray	25	370
4/16-14G1. M. H. Norris. Altitude about 1790 ft. Drilled by Gorge Contractors, Inc., 1968. Cased to 20 ft.		
Clay	8	8
Boulders; clay	3	11
Clay, blue	1	12
Shale [clay], blue	15	27
Basalt	33	60
Basalt, fractured	20	80
Claystone; shale [clay]	28	108
Basalt	2	110
Shale [clay]	14	124
Basalt	18	142

Material	Thickness (ft)	Depth (ft)

4/16-15E1. Wash. State Patrol. Altitude about 1680 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 34 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown; boulders	2	2
Basalt, gray	17	19
Clay, brown	14	33
Basalt, gray	20	53
Basalt, fractured	9	62
Sandstone, brown	3	65
Basalt, vesicular; clay	10	75
Basalt, vesicular, gray, water-bearing	19	94
Basalt, gray	6	100

4/16-15L1. Maxine Knosher. Altitude about 1680 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 15 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	4	4
Shale [clay], hard	3	7
Basalt, hard, gray	86	93
Basalt, vesicular, water-bearing	12	105
Basalt, fractured	10	115
Basalt, hard, gray	5	120

4/16-15N1. Maxine Knosher. Altitude about 1680 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 18 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	4	4
Shale [clay], hard	3	7
Basalt, hard, gray	84	91
Lava basalt, black	1	92
Basalt, vesicular, water-bearing	10	102
Basalt, fractured, gray	3	105

4/16-16Q1. Fred Stone. Altitude about 1640 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 29 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	5	5
Clay; gravel, coarse	22	27

(continued)

4/16-16Q1. Continued.

Material	Thickness (ft)	Depth (ft)
Conglomerate [gravel]; clay, water-bearing	10	37
Basalt	3	40

4/16-18P1. O'Leary Well Drilling, Inc. Altitude about 1620 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 35 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	4	4
Sandstone, gray	19	23
Clay, red	3	26
Sandstone, brown; clay	4	30
Sandstone, gray	12	42
Basalt, fractured, gray	12	54
Basalt, vesicular, gray; clay	2	56
Sandstone, brown	11	67
Basalt, vesicular, gray	5	72
Sandstone; clay	6	78
Sandstone, brown	3	81
Basalt, gray	11	92
Basalt, vesicular, gray; clay	3	95
Basalt, vesicular; clay	5	100
Basalt, vesicular; clay	8	108
Basalt, vesicular, black, water-bearing, 26 gpm	5	113
Basalt, gray	29	142
Sandstone; clay	5	147
Sandstone, gray; clay; gravel, water-bearing, 8 gpm	5	152
Clay, green	1	153
Sandstone, brown	2	155
Basalt, fractured, gray	4	159
Sandstone, brown; clay	11	170
Basalt, gray	30	200
Basalt, fractured, gray	6	206
Basalt, gray	14	220
Clay, white	2	222
Basalt, vesicular, black; clay	18	240

(continued)

Material	Thickness (ft)	Depth (ft)
4/16-18P1. Continued.		
Basalt, fractured, gray ----------	10	250
Basalt, gray ---------------------	60	310
Claystone, white; basalt, vesicular	4	314
Basalt, weathered ----------------	6	320
4/16-20G3. Harry Moore. Altitude about 1610 ft. Drilled by O'Leary Well Drilling, Inc., 1970. Cased to 20 ft.		
Clay, brown ----------------------	3	3
Basalt, gray ---------------------	26	29
Basalt, fractured; clay ----------	7	36
Basalt, vesicular, blue, black ----	14	50
Basalt, gray ---------------------	58	108
Basalt, vesicular; clay ----------	2	110
Basalt, gray ---------------------	6	116
Basalt, fractured; clay ----------	5	121
Clay, white ----------------------	3	124
Basalt, vesicular ----------------	9	133
Basalt, gray ---------------------	5	138
Basalt, brown --------------------	5	143
Basalt, gray ---------------------	47	190
4/16-20K1. Boise Cascade. Altitude about 1610 ft. Drilled by Riebe Well Drilling, 1966. Cased to 26 ft.		
Clay; sand; gravel ---------------	6	6
Boulders, large; clay ------------	19	25
Basalt, weathered ----------------	43	68
Basalt, black --------------------	36	104
Clay, green; gravel; carbonaceous material, water-bearing, 20 gpm -	26	130
Basalt, weathered, black, water-bearing, 30 gpm ----------------	32	162
Basalt, fractured, black and gray, water-bearing ------------------	10	172
Basalt, very hard, iron gray ------	140	312
Clay, brown, water-bearing, 10 gpm	2	314

(continued)

Material	Thickness (ft)	Depth (ft)
4/16-20K1. Continued.		
Basalt, fractured, gray; water-bearing, 15 gpm ----------------	14	328
Basalt, very hard, iron gray ------	9	337
4/16-21B2. D. Wedgewood. Altitude about 1650 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 19 ft.		
Soil, shale [clay] ---------------	3	3
Clay, brown ----------------------	2	5
Clay, brown ----------------------	5	10
Clay, brown ----------------------	2	12
Clay, brown ----------------------	5	17
Basalt, gray ---------------------	15	32
Basalt, fractured, gray ----------	7	39
Basalt, gray ---------------------	18	57
Shale [clay], brown --------------	2	59
Basalt, gray ---------------------	3	62
Basalt, vesicular, gray ----------	7	69
Basalt, gray ---------------------	8	77
Clay, white ----------------------	6	83
Basalt, fractured, vesicular, gray, water-bearing, 170 gpm ---------	50	133
Basalt, gray ---------------------	9	142
Basalt, fractured, light gray -----	6	148
Basalt, gray ---------------------	15	163
Basalt, fractured, gray ----------	8	171
Basalt, gray ---------------------	44	215
Basalt, fractured; shale [clay] ---	20	235
Basalt, gray ---------------------	58	293
Basalt, vesicular, black; shale [clay] -------------------------	28	321
Basalt, fractured, black ---------	11	332
Basalt, fractured, gray ----------	6	338
Basalt, vesicular, gray ----------	4	342
Basalt, fractured, gray, water-bearing -----------------------	15	357
Basalt, gray ---------------------	101	458
Basalt, vesicular, black; shale [clay] -------------------------	12	470
Conglomerate [gravel], gray; clay; basalt, vesicular, water-bearing	20	490

4/16-21K1. C. L. Mesecher. Altitude about 1690 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Deepened by O'Leary Well Drilling, Inc., 1974. Cased to 63 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	9	9
Clay, brown	37	46
Clay, white and brown	9	55
Basalt, vesicular	6	61
Basalt, fractured, gray	19	80
Basalt, gray, water-bearing	28	108
Basalt, gray	77	185
Basalt, fractured, water-bearing	3	188
Basalt, gray	17	205
Basalt, gray	51	256
Basalt, vesicular, fractured, black	11	267
Basalt, gray	11	278
Basalt, fractured, vesicular, black	29	307
Basalt, gray	4	311

4/16-22L1. Gorge Contractors, Inc. Altitude about 1750 ft. Drilled by Gorge Contractors, Inc., 1968. Cased to 45 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	3	3
Shale [clay]	19	22
Clay	14	36
Clay, white	4	40
Shale [clay]	3	43
Shale [clay]	12	55
Basalt	105	160
Basalt; clay, water-bearing	5	165
Basalt	5	170

4/16-26K1. Eleanor Dooley. Altitude about 1840 ft. Drilled by Gorge Contractors, Inc., 1968.

Material	Thickness (ft)	Depth (ft)
Clay	12	12
Basalt, fractured	20	32
Basalt	110	142

4/16-27E1. Rex Maurer. Altitude about 1760 ft. Drilled by Gorge Contractors, Inc., 1968. Cased to 20 ft.

Material	Thickness (ft)	Depth (ft)
Clay, sandy	6	6
Basalt, vesicular, red; clay	6	12
Lava [basalt], gray	16	28
Basalt, vesicular, red; clay	12	40
Basalt	43	83
Clay, white	12	95
Basalt	122	217

4/16-28A3. Dwight Dingmon. Altitude about 1720 ft. Drilled by Gorge Contractors, Inc., 1968. Deepened by L & L Drilling, Inc., 1972. Cased to 32 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	6	6
Lava [basalt], gray	12	18
Clay, red	2	20
Cinder [basalt], red	1	21
Lava [basalt], gray	5	26
Sand	2	28
Shale [clay]	52	80
Claystone, white	1	81
Basalt	18	99
Basalt, fractured	2	101
Basalt	174	275
Cinder [basalt], red; clay	1	276
Basalt	29	305
Basalt, fractured; clay	2	307
Basalt, broken, black; clay	6	313
Basalt, gray	147	460
Shale [clay], black	1	461
Basalt, broken, black	9	470
Shale [clay], brown	10	480
Basalt, broken, black	50	530
Basalt, gray	1	531

4/16-29H2. R. E. Hornibrook. Altitude about 1700 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 20 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	4	4
Clay, brown	12	16
Basalt, blue-black	71	87
Claystone, brown	6	93
Clay, white	4	97
Rock [basalt], water-bearing	26	123
Basalt, fractured, gray	3	126
Basalt, gray	4	130

4/16-31G1. Norman Dingmon. Altitude about 1650 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 43 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	7	7
Basalt, fractured; clay	11	18
Clay, white	2	20
Clay, brown	4	24
Basalt, vesicular, gray; clay	6	30
Basalt, vesicular; gravel; clay	7	37
Basalt, vesicular, black	5	42
Basalt, fractured, black	7	49
Basalt, fractured, gray	12	61
Basalt, fractured, gray; shale [clay]	4	65
Basalt, brown; clay	20	85
Clay, white	7	92
Basalt, vesicular, brown; clay	8	100
Shale [clay], brown	8	108
Basalt, vesicular, gray	4	112
Basalt, fractured, gray	3	115

4/16-32A1. C. R. Blanchard. Altitude about 1715 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 20 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	2	2
Basalt, black	40	42
Basalt, vesicular	34	76
Basalt, fractured, gray	26	102

4/16-32N1. Glen Seward. Altitude about 1680 ft. Drilled by O'Leary Well Drilling, Inc., 1975. Cased to 19 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	14	14
Basalt, gray	35	49
Shale [clay], water-bearing	20	69
Basalt, gray	10	79
Basalt, fractured, gray, water-bearing	18	97
Basalt, fractured, gray	33	130

4/16-34H1. Marvin H. Norris. Altitude about 1840 ft. Drilled by Gorge Contractors, Inc., 1968. Deepened by O'Leary Well Drilling, Inc., 1971. Cased to 102 ft.

Material	Thickness (ft)	Depth (ft)
Clay	26	26
Lava [basalt], gray	6	32
Basalt	12	44
Claystone, water-bearing	46	90
Basalt, fractured	15	105
Basalt	7	112
Basalt, gray	17	129
Shale [clay], brown	7	136
Basalt, fractured, gray	17	153
Basalt, fractured, gray	7	160
Basalt, fractured, gray	22	182
Basalt, fractured, gray	22	204
Basalt, gray	40	244
Basalt, fractured, gray	8	252
Basalt, gray	25	277
Basalt, vesicular, gray	26	303
Basalt, fractured, gray	10	313
Basalt, gray	127	440
Basalt, gray; clay	4	444
Basalt, vesicular, gray	6	450
Basalt, fractured	17	467
Basalt, vesicular, gray; clay	2	469
Basalt, hard, vesicular, gray	13	482
Basalt, vesicular, black	5	487
Basalt, vesicular	13	500

4/17-2P1. Eleanor Dooley. Altitude about 2180 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 5 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	3	3
Basalt, fractured	72	75
Shale [clay], brown	3	78
Basalt, water-bearing	4	82
Slate [basalt?]	13	95
Claystone, blue; lava [basalt]	6	101
Basalt	207	308

4/17-9F1. O'Leary Well Drilling, Inc. Altitude about 2410 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 131 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	3	3
Basalt; clay	46	49
Cinder [basalt], red; clay	64	113
Basalt, vesicular; clay	13	126
Basalt, fractured	194	320
Basalt, fractured; clay, water-bearing	20	340
Basalt, gray	15	355

4/17-19G2. C. Fridley. Altitude about 2050 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 47 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	4	4
Shale [clay]; boulders	8	12
Clay, brown	22	34
Basalt, fractured, gray	45	79
Clay, brown	16	95
Basalt, gray	6	101
Shale [clay], brown	21	122
Basalt, gray	24	146
Shale [clay], brown	21	167
Basalt, gray	5	172
Shale [clay], brown	13	185

(continued)

4/17-19G2. Continued.

Material	Thickness (ft)	Depth (ft)
Basalt, gray	22	207
Basalt, fractured; clay	29	236
Basalt, gray	12	248
Basalt, fractured, water-bearing	3	251

4/17-22N1. Fenton Bros. Altitude about 2000 ft. Drilled by Ira Morrison, date unknown. Cased to 41 ft.

Material	Thickness (ft)	Depth (ft)
Clay	39	39
Porous rock [basalt, vesicular?]	2	41

4/17-29P1. Sheryl Willis. Altitude about 1960 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 78 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	2	2
Clay	6	8
Basalt, hard	17	25
Basalt, fractured	39	64
Clay	13	77
Conglomerate [gravel], water-bearing	8	85
Basalt	7	92
Lava [basalt], clay	15	107
Shale [clay]	33	140
Basalt	80	220
Basalt; clay, water-bearing	44	264
Basalt	38	302
Claystone, black	6	308
Basalt	10	318
Basalt	187	505
Basalt, fractured	7	512
Basalt	13	525
Basalt	13	538

4/17-30A1. Wayne Hoctor. Altitude about 2010 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 100 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	98	98

(continued)

4/17-30A1. Continued.

Material	Thickness (ft)	Depth (ft)
Basalt, gray	160	258
Basalt, vesicular, fractured, gray	28	286
Basalt, gray	117	403
Basalt, vesicular, brown, water-bearing	9	412
Basalt, vesicular, gray	18	430

4/17-30R1. Sheryl Willis. Altitude about 1930 ft. Drilled by L & L Drilling Co., Inc., 1972. Cased to 55 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	5	5
Boulders; gravel	50	55
Basalt, gray	115	170
Basalt, fractured	12	182
Basalt, hard, gray	232	414
Basalt, black	35	449
Basalt, hard, gray	51	500
Basalt, medium, gray	26	526
Basalt, hard, gray	121	647
Clay, green	27	674
Basalt, fractured, water-bearing	10	684
Basalt, black	11	695
Basalt, hard, gray	5	700

4/17-31M1. T. V. Wilkins. Altitude about 1865 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 18 ft.

Material	Thickness (ft)	Depth (ft)
Clay	6	6
Clay	6	12
Shale [clay]	2	14
Basalt, hard	158	172
Basalt, fractured; clay, water-bearing	5	177

4/17-32P1. Emmett Hoctor. Altitude about 1920 ft. Drilled by Gorge Contractors, Inc., 1970. Cased to 40 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	2	2
Shale [clay], brown	8	10

(continued)

4/17-32P1. Continued.

Material	Thickness (ft)	Depth (ft)
Basalt, gray	11	21
Basalt, fractured, brown	11	32
Claystone, brown	3	35
Clay, green	5	40
Basalt, vesicular, gray, water-bearing	32	72
Claystone, brown	1	73
Basalt, gray	151	224
Basalt, vesicular, fractured, water-bearing	3	227
Basalt, gray	1	228

4/18-29G1. Raymond R. Brack. Altitude about 1680 ft. Drilled by Reibe Well Drilling, 1968. Cased to 138 ft.

Material	Thickness (ft)	Depth (ft)
Clay, sandy	2	2
Clay; boulders	9	11
Clay, brown; gravel, water-bearing	72	83
Basalt, fractured, gray	67	150
Clay, yellow; sand; gravel, water-bearing	30	180
Basalt, very hard, gray	40	220
Clay, brown; basalt, fractured, water-bearing	57	277

4/20-3L1. Harland Berk. Altitude about 2205 ft. Drilled by Gib King, 1969. Cased to 182 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	4	4
Conglomerate [gravel]	2	6
Rock [basalt], brown; clay	10	16
Rock [basalt], fractured	16	32
Boulders	70	102
Clay	8	110
Sandstone, soft	10	120
Sand	20	140
Sand; gravel	8	148
Clay	21	169

(continued)

4/20-3L1. Continued.

Material	Thickness (ft)	Depth (ft)
Clay; rock [basalt]	2	171
Sandstone, soft, water-bearing	6	177
Rock [basalt], fractured	5	182
Rock [basalt]	20	202
Rock [basalt], water-bearing	72	274

4/20-4D1. Sam Berk. Altitude about 2274 ft. Drilled by Gib King, 1969. Cased to 35 ft.

Material	Thickness (ft)	Depth (ft)
Soil	3	3
Boulders	27	30
Rock [basalt]	72	102
Rock [basalt], soft, brown	11	113
Sandstone, soft	30	143
Clay, yellow	17	160
Clay, blue, tan, brown, gray	145	305
Rock [basalt], broken; shale [clay]	30	335

4/20-18Q1. Bert Wilkins. Altitude about 2440 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 19 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	2	2
Clay, brown	10	12
Basalt, vesicular	33	45
Basalt, fractured	62	107
Basalt, fractured; clay	12	119
Clay, soft, yellow	16	135
Sand; clay, water-bearing, 10 gpm	39	174
Claystone, soft, yellow	18	192
Claystone, soft, bluish-green	13	205
Clay, gray	48	253

4/20-20Q1. Bob Powers. Altitude about 2180 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 119 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown and blue	110	110
Basalt, vesicular, fractured, gray, water-bearing	37	147
Basalt, gray	28	175

5/10-35F1. Orlis Hale. Altitude about 960 ft. Drilled by Hansen Drilling Co., Inc., 1973. Cased to 150 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	3	3
Rock [basalt], broken	15	18
Rock [basalt], fractured, medium	20	38
Rock [basalt], decomposed	17	55
Rock [basalt], decomposed; clay	36	91
Rock [basalt], broken	3	94
Rock [basalt]	8	102
Rock [basalt], fractured	30	132
Rock [basalt], decomposed; sand, water-bearing	23	155

5/11-31R1. Mt. Adams Orchard Company. Altitude about 1360 ft. Drilled by Hansen Drilling Co., Inc., 1965. Cased to 333 ft.

Material	Thickness (ft)	Depth (ft)
Boulders; soil; clay	39	39
Basalt, fractured	62	101
Rock [basalt], red; clay	7	108
Basalt, hard, gray	8	116
Basalt, soft, black	20	136
Basalt, fractured	81	217
Rock [basalt], red; clay; gravel	7	224
Clay, red, brown, white; gravel	106	330
Basalt, fractured	12	342
Basalt, very soft	26	368
Basalt, fractured, hard	7	375
Clay, yellow and brown	15	390
Basalt, fractured	104	494
Basalt, very hard	37	531
Basalt, fractured	69	600

5/11-32N1. Hopp-DeWilde Mill Co. Altitude about 1360 ft. Drilled by George L. Zent, 1947. Cased to 23 ft.

Material	Thickness (ft)	Depth (ft)
Soil	4	4
Clay	13	17

(continued)

Material	Thickness (ft)	Depth (ft)
5/11-32N1. Continued.		
Lava [basalt] --------------------	30	47
Cinders, red, water-bearing -------	8	55
Lava [basalt], water-bearing ------	12	67
Cinders [basalt], red, water-bearing ------------------------	8	75

5/12-18E1. Darrell Lee. Altitude about 1860 ft. Drilled by 4 Star Drilling Co., 1969. Cased to 160 ft.

Material	Thickness (ft)	Depth (ft)
Sand; gravel; boulders -----------	145	145
Sand; gravel; boulders, water-bearing -----------------------	15	160

5/13-26D1. Don Roane. Altitude about 2330 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 49 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown ----------------------	8	8
Shale [clay], brown; basalt, fractured --------------------------	37	45
Basalt, gray ---------------------	70	115
Basalt, fractured, black; clay, water-bearing ------------------	11	126
Basalt, gray ---------------------	4	130

5/14-6E1. St. Regis Paper Co. Altitude about 1180 ft. Drilled by R. J. Strasser, 1954. Cased to 297 ft.

Material	Thickness (ft)	Depth (ft)
Clay; rock [basalt], broken, black	47	47
Rock [basalt], hard, black --------	13	60
Rock [basalt], brown -------------	3	63
Rock [basalt], black -------------	12	75
Basalt, gray ---------------------	21	96
Rock [basalt], black, porous ------	14	110
Rock [basalt], broken, black ------	58	168
Rock [basalt], caving, black ------	4	172
Rock [basalt], black -------------	65	237

(continued)

Material	Thickness (ft)	Depth (ft)
5/14-6E1. Continued.		
Clay, red ------------------------	12	249
Rock [basalt], broken, brown; clay	13	262
Rock [basalt], broken, water-bearing ------------------------	32	294
Rock [basalt], broken; clay; gravel	32	326

5/14-21A1. Wash. Dept. of Game. Altitude about 1870 ft. Drilled by Hansen Drilling Co., 1964. Cased to 21 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil --------------------------	2	2
Basalt, hard, trace of water ------	12	14
Basalt, hard, gray-black ----------	35	49
Basalt, hard, black, trace of water	9	58
Basalt, medium-hard, gray-black ---	12	70
Basalt, hard, black --------------	10	80
Basalt, very hard, blue-black -----	68.5	148.5
Basalt, porous, gray, trace of water --------------------------	21.5	170
Basalt, gray, trace of water ------	21	191
Shale [clay], blue ----------------	3	194
Basalt, medium hard, gray ---------	21	215
Basalt, hard, blue ----------------	3	218
Basalt, medium, gray-black, trace of water -----------------------	31	249
Basalt, medium, gray -------------	12	261
Basalt, medium hard, gray-black, trace of water -----------------	5	266
Basalt, medium, gray -------------	12	278
Basalt, gray-black, trace of water	52	330
Basalt, gray, greenish-brown, water-bearing, 2 1/2 gpm --------	10	340
Basalt, black --------------------	4	344
Pumice-ash, black [clay?], water-bearing, 4 gpm -----------------	25	369
Basalt, medium hard, red ----------	1	370
Basalt, gray-black, water-bearing 9 gpm --------------------------	15	385

Material	Thickness (ft)	Depth (ft)
5/14-22K1. Ralph C. & Ruth M. McKinney. Altitude about 1830 ft. Drilled by O'Leary Well Drilling, Inc., 1970. Cased to 90 ft.		
Clay ----------------------------	4	4
Clay, brown ----------------------	5	9
Shale [clay], gray ---------------	13	22
Basalt, hard, gray ---------------	17	39
Basalt, fractured; clay ----------	37	76
Conglomerate [gravel]; clay; sand -	14	90
Basalt, vesicular, brown ---------	14	104
Basalt, gray ---------------------	34	138
Basalt, vesicular, fractured, gray, water-bearing ------------------	26	164
Basalt, fractured, gray-brown -----	26	190
5/14-26L2. Victor Bryant. Altitude about 1720 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 132 ft.		
Clay; boulders -------------------	8	8
Basalt, gray ---------------------	90	98
Clay, green and brown ------------	29	127
Basalt, vesicular, gray ----------	6	133
Basalt, gray ---------------------	9	142
Basalt, vesicular, brown ---------	6	148
Basalt, gray ---------------------	25	173
Basalt, vesicular, gray ----------	6	179
Basalt, gray ---------------------	3	182
5/14-36R1. Ted Richardson. Altiutde about 1600 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 4 ft.		
Clay, brown ----------------------	5	5
Boulders -------------------------	11	16
Clay, brown ----------------------	34	50
Basalt, vesicular, gray; clay -----	5	55
Basalt, vesicular, gray ----------	9	64
Basalt, vesicular, gray; clay -----	9	73

(continued)

Material	Thickness (ft)	Depth (ft)
5/14-36R1. Continued.		
Basalt, fractured, gray ----------	4	77
Basalt, gray ---------------------	10	87
Clay, brown ----------------------	5	92
Cinder [basalt]; clay ------------	8	100
Basalt, vesicular; clay ----------	7	107
Clay, brown ----------------------	13	120
Cinder [basalt]; shale [clay] -----	7	127
Basalt, gray ---------------------	4	131
Cinder [basalt]; shale [clay] -----	5	136
Clay, sandy, brown ---------------	3	139
Sandstone, brown; gravel ---------	12	151
Sandstone, gray; clay ------------	8	159
Shale [clay]; basalt, fractured ---	4	163
Basalt, fractured, gray ----------	6	169
Basalt, gray ---------------------	143	312
Basalt, fractured, gray; sandstone, water-bearing ------------------	5	317
Sandstone, green, water-bearing ---	3	320
Clay, sandy, green, water-bearing -	2	322
Sand, fine, green, water-bearing --	18	340
5/15-10K1. Fred Linton. Altitude about 2410 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 86 ft.		
Clay, green ----------------------	8	8
Gravel ---------------------------	8	16
Clay, brown ----------------------	65	81
Basalt, fractured; clay ----------	41	122
Cinder [basalt], red -------------	66	188
Basalt, vesicular ----------------	117	305
Basalt, vesicular, brown, water-bearing -----------------------	5	310
Basalt, vesicular, gray ----------	27	337
Clay, gray -----------------------	3	340

Material	Thickness (ft)	Depth (ft)
5/15-19P1. Otis M. Prescott. Altitude about 2000 ft. Drilled by M. R. Drilling Co., 1961. Cased to 28 ft.		
Soil; clay	25	25
Cinder [basalt]	5	30
Basalt, very hard, gray	95	125
Cinder [basalt], brown; clay	20	145
Basalt, vesicular, brown; gravel	3	148
Cinder [basalt], brown; clay	15	163
Basalt, gray	3	166
Cinder [basalt], red; clay	21	187
5/15-22H1. Larry Boardman. Altitude about 2080 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 25 ft.		
Clay; gravel	50	50
Basalt, gray	135	185
Clay; basalt	40	225
Basalt, vesicular; clay	47	272
Sandstone, brown, water-bearing	33	305
Basalt, vesicular	196	501
Clay, brown	11	512
Basalt, vesicular, gray	23	535
5/15-25L2. Lloyd Case. Altitude about 2160 ft. Drilled by Riebe Drilling Co., 1968.		
Clay, hard	8	8
Cinder [basalt]	20	28
Basalt, very hard, gray	25	53
Cinder [basalt], red	8	61
Basalt, gray	6	67
Cinder [basalt]	7	74
Basalt, very hard, gray	64	138
Basalt, vesicular and fractured	252	390
Basalt, gray	20	410
Cinder [basalt]	80	490
Basalt, very hard, gray	20	510
Cinder [basalt], red	65	575
Basalt, gray	15	590

(continued)

Material	Thickness (ft)	Depth (ft)
5/15-25L2. Continued.		
Basalt, broken, vesicular	15	605
Basalt, very hard, gray	20	625
Basalt, broken	10	635
Basalt, very hard, gray	23	658
Basalt, broken	51	709
Basalt, broken, gray	23	732
Basalt, fractured, gray	40	772
Basalt, gray	8	780
Basalt, broken, black, trace of water	17	797
Basalt, very hard, gray	13	810
Basalt, broken, trace of water	8	818
Basalt, very hard, gray	14	832
Basalt, broken, black	17	849
Basalt, broken, black; shale [clay]	15	864
Basalt, very hard, gray	24	888
Basalt, black and gray	14	902
Basalt, very hard, fractured, gray	60	962
Clay, yellow; sand; gravel, water-bearing	8	970
Conglomerate [gravel], water-bearing	13	983
Basalt, very hard, gray	7	990
5/15-31J1. Paul Schilling. Altitude about 1720 ft. Drilled by O'Leary Well Drilling, Inc., 1975. Cased to 53 ft.		
Clay, brown	3	3
Basalt	20	23
Clay; basalt	25	48
Basalt, vesicular, red; clay	238	286
Basalt, vesicular, gray and brown, some water	16	302
Basalt	48	350
Basalt, vesicular, brown; clay, some water	12	362
Basalt, gray	40	402
Basalt, vesicular, brown; clay, some water	14	416
Basalt, fractured, some water	156	572

(continued)

Material	Thickness (ft)	Depth (ft)
5/15-31J1. Continued.		
Basalt, gray ----------------------	4	576
Basalt, fractured; clay -----------	11	587
Basalt, fractured, gray -----------	53	640
Basalt, vesicular, black, water-bearing ------------------------	5	645

5/15-32Q1. Mike Counts. Altitude about 1720 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 61 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown ----------------------	2	2
Clay, brown ----------------------	8	10
Basalt, gray ---------------------	15	25
Clay; gravel ---------------------	32	57
Basalt, gray ---------------------	7	64
Cinders [basalt]; clay -----------	16	80
Basalt, vesicular; clay ----------	14	94
Basalt, vesicular, gray ----------	4	98
Basalt, fractured, gray ----------	13	111
Basalt, vesicular, gray ----------	8	119
Basalt, fractured, brown ---------	33	152
Basalt, fractured, gray ----------	16	168
Basalt, gray ---------------------	20	188
Basalt, fractured, gray ----------	9	197
Basalt, fractured, vesicular; clay	10	207
Clay, green ----------------------	11	218
Sandstone; clay; gravel ----------	34	252
Sand, green and blue -------------	13	265

5/16-6D1. George Wright. Altitude about 3400 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 37 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown ----------------------	2	2
Boulder --------------------------	2	4
Clay, brown ----------------------	4	8
Basalt, gray ---------------------	16	24
Clay, red ------------------------	3	27
Cinder [basalt], red -------------	2	29

(continued)

Material	Thickness (ft)	Depth (ft)
5/16-6D1. Continued.		
Basalt, vesicular, gray; clay -----	6	35
Sandstone, gray -------------------	5	40
Basalt, vesicular, gray -----------	8	48
Basalt, vesicular, gray; clay -----	4	52
Basalt, vesicular, gray -----------	48	100
Basalt, fractured, gray; sand -----	14	114
Basalt, vesicular, gray; clay -----	16	130
Basalt, vesicular, gray; clay -----	30	160
Basalt, gray ----------------------	8	168
Cinder [basalt]; clay -------------	7	175
Basalt, vesicular, brown ----------	9	184
Sandstone, brown ------------------	10	194
Basalt, gray ----------------------	20	214
Basalt, vesicular, brown ----------	30	244
Basalt, vesicular, brown; clay ----	6	250
Cinder [basalt]; clay -------------	6	256
Sandstone, brown ------------------	19	275
Basalt, gray ----------------------	5	280
Sandstone, gray -------------------	11	291
Sandstone, brown; basalt, vesicular	4	295
Sandstone, white, water-bearing ---	13	308
Sandstone, brown, water-bearing ---	2	310

5/16-25Q1. Department of Health, Education and Welfare. Altitude about 2120 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 221 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown -----------------------	4	4
Conglomerate [gravel] -------------	3	7
Basalt, fractured, gray -----------	24	31
Clay, brown -----------------------	4	35
Basalt, vesicular, gray -----------	18	53
Basalt, gray ----------------------	62	115
Basalt, fractured, gray; shale [clay] -------------------------	8	123
Basalt, vesicular, black ----------	12	135
Basalt, gray ----------------------	82	217
Basalt, vesicular; clay -----------	20	237
Basalt, gray ----------------------	11	248

Material	Thickness (ft)	Depth (ft)

5/16-27M1. Paul Middleton. Altitude about 2200 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 87 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	9	9
Basalt, broken; clay	73	82
Basalt, fractured	32	114
Cinder [basalt], red	12	126
Basalt, vesicular	56	182
Basalt, fractured and vesicular, red	142	324
Basalt, vesicular, red	7	331
Clay; sand	29	360
Gravel; sand	21	381

5/16-28R1. Mike Austin. Altitude about 2160 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 32 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	2	2
Boulders	21	23
Clay, red	4	27
Basalt, vesicular, brown	5	32
Basalt, brown	10	42
Basalt, gray	6	48
Basalt, vesicular, gray; clay	9	57
Basalt, vesicular, gray; clay	25	82
Basalt, vesicular, gray	3	85
Cinder [basalt, vesicular]	3	88
Basalt, vesicular, brown	3	91
Basalt, vesicular; clay	9	100
Basalt, vesicular, brown	8	108
Basalt, vesicular, gray; clay	26	134
Cinder [basalt, vesicular]	13	147
Basalt, fractured, gray	49	196
Cinder [basalt], red; clay; sand	15	211
Basalt, vesicular, gray; clay	12	223
Basalt, gray	14	237
Cinder [basalt]; clay	4	241
Sandstone, brown	9	250
Basalt, gray	38	288

(continued)

5/16-28R1. Continued.

Material	Thickness (ft)	Depth (ft)
Claystone, red	5	293
Basalt, vesicular, gray; clay	3	296
Sandstone, gray	4	300
Basalt, vesicular, gray	8	308
Sandstone, brown	2	310

5/16-31K1. R. Scheradella. Altitude about 1940 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 72 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	8	8
Clay, brown; basalt, vesicular	9	17
Basalt, vesicular; clay	7	24
Clay, brown	2	26
Basalt, vesicular, gray	4	30
Basalt, vesicular, gray; clay	11	41
Cinders [basalt], red	11	52
Basalt, vesicular, gray	16	68
Basalt, fractured	1	69
Basalt, vesicular, hard, gray	4	73
Basalt, gray	12	85
Basalt, fractured, gray	18	103
Basalt, gray	10	113
Basalt, vesicular, fractured, gray	8	121
Basalt, vesicular, gray	30	151
Cinders [basalt], red	11	162
Basalt, fractured, vesicular, gray	64	226
Basalt, vesicular, gray, water-bearing	24	250

5/16-33D1. United Homes Corp. Altitude about 2160 ft. Drilled by O'Leary Well Drilling, Inc., 1970. Cased to 54 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	5	5
Basalt; boulders	3	8
Clay, brown	10	18
Basalt, vesicular	34	52
Basalt, vesicular	121	173

(continued)

Material	Thickness (ft)	Depth (ft)
5/16-33D1. Continued.		
Basalt, gray ----------------------	27	200
Cinder [basalt], hard, red --------	7	207
Basalt, vesicular, hard -----------	78	285
Cinder [basalt], hard, red --------	19	304
Basalt, hard, gray ----------------	21	325
Basalt, fractured; clay -----------	55	380
Basalt, vesicular, gray -----------	71	451
Claystone, brown ------------------	4	455
Sandstone; clay, water-bearing ----	30	485
Claystone, brown ------------------	5	490

5/16-34D1. Norm Evans. Altitude about 2120 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 75 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown -----------------------	5	5
Clay; boulders --------------------	18	23
Clay, black -----------------------	4	27
Clay, brown -----------------------	8	35
Sandstone, gray -------------------	6	41
Basalt, vesicular, gray; clay -----	14	55
Sandstone, gray -------------------	6	61
Clay, brown -----------------------	5	66
Sandstone, gray; clay -------------	8	74
Sandstone, gray -------------------	34	108
Sandstone -------------------------	109	217
Basalt, vesicular, gray; clay -----	3	220
Basalt, vesicular, gray -----------	10	230
Sandstone, gray -------------------	15	245
Basalt, vesicular; clay -----------	2	247
Clay, red -------------------------	3	250
Sandstone, brown ------------------	28	278
Basalt, gray ----------------------	78	356
Cinder [basalt]; clay -------------	8	364
Sandstone, brown ------------------	6	370
Sandstone, hard, gray -------------	5	375
Sandstone, brown ------------------	8	383
Clay, silty, red ------------------	2	385

5/17-3L1. Brooks State Park. Altitude about 2600 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 91 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil ---------------------------	2	2
Clay, red -------------------------	28	30
Gravel, coarse; boulders; clay ----	4	34
Clay, red -------------------------	18	52
Clay, yellow ----------------------	38	90
Basalt, vesicular, soft; clay, water-bearing, 50 gpm -----------	4	94
Sandstone, soft, brown ------------	11	105
Sandstone, soft, blue -------------	10	115

5/17-3N1. Dr. G. J. Timmer. Altitude about 2500 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 143 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown -----------------------	6	6
Gravel; clay, water-bearing -------	17	23
Clay, brown -----------------------	23	46
Clay, white -----------------------	6	52
Sandstone, white; gravel ----------	31	83
Sandstone, white; clay ------------	12	95
Sandstone, white; clay, water-bearing ------------------------	12	107
Clay, green -----------------------	33	140
Sandstone, green and white --------	16	156
Clay, green -----------------------	4	160

5/17-20N2. Addison Lane. Altitude about 2440 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 19 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown -----------------------	2	2
Basalt, gray ----------------------	106	108
Basalt; shale [clay] --------------	56	164
Basalt, vesicular, gray -----------	142	306
Claystone, brown ------------------	6	312
Basalt, fractured, gray -----------	31	343
Basalt, gray ----------------------	210	553

(continued)

Material	Thickness (ft)	Depth (ft)
5/17-20N2. Continued.		
Basalt, fractured, vesicular ------	19	572
Basalt, hard, gray ---------------	128	700
5/17-23G1. The Trans West Company. Altitude about 2560 ft. Drilled by O'Leary Well Drilling, Inc., 1970. Cased to 54 ft.		
Clay, sandy, brown ---------------	2	2
Clay, brown ----------------------	7	9
Sandstone; clay ------------------	2	11
Basalt, fractured ----------------	27	38
Clay, white ----------------------	3	41
Basalt, fractured; clay ----------	9	50
Basalt, vesicular, gray and brown, water-bearing ------------------	13	63
Basalt, fractured ----------------	51	114
Basalt, gray ---------------------	162	276
Basalt, vesicular; clay ----------	20	296
Basalt, fractured ----------------	64	360
Basalt, gray ---------------------	10	370
5/17-31K1. Darryl Sines. Altitude about 1920 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 99 ft.		
Clay, brown ----------------------	3	3
Basalt, fractured, gray; clay -----	8	11
Clay, brown ----------------------	7	18
Clay, brown ----------------------	38	56
Shale [clay], gray ---------------	14	70
Basalt, fractured, gray; shale [clay] -------------------------	17	87
Shale [clay], brown --------------	13	100
Basalt, fractured, gray; shale [clay] -------------------------	9	109
Basalt, fractured, gray -----------	3	112
Basalt, fractured, gray -----------	3	115

Material	Thickness (ft)	Depth (ft)
5/17-32D1. The Trans West Company. Altitude about 2000 ft. Drilled by O'Leary Well Drilling, Inc., 1972. Cased to 19 ft.		
Clay, brown ----------------------	4	4
Clay; boulders -------------------	8	12
Boulders -------------------------	6	18
Basalt, fractured, vesicular, water-bearing ------------------	187	205
5/20-9A1. H. Hooker. Altitude about 2780 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 19 ft.		
Clay, brown ----------------------	3	3
Basalt, gray ---------------------	16	19
Basalt, brown --------------------	12	31
Basalt, fractured, brown ----------	13	44
Basalt, gray ---------------------	36	80
Basalt, fractured, gray, water-bearing ------------------------	16	96
Basalt, gray ---------------------	19	115
Sandstone; clay ------------------	9	124
Sandstone, brown, water-bearing ---	21	145
5/20-28B1. Berk Brothers, Inc. Altitude about 2490 ft. Drilled by Gib King Well Drilling, 1969. Cased to 146 ft.		
Soil -----------------------------	3	3
Rock [basalt], brown -------------	17	20
Basalt, gray ---------------------	78.5	98.5
Clay; gravel ---------------------	16.5	115
Sandstone, soft ------------------	23	138
Gravel ---------------------------	6	144
Rock [basalt], black -------------	24	168
Rock [basalt], broken, black, water-bearing ------------------	8	176
Rock [basalt], black -------------	18	194
Rock [basalt], gray --------------	18	212
Rock [basalt], gray; clay ---------	3	215

(continued)

Material	Thickness (ft)	Depth (ft)
5/20-28B1. Continued		
Rock [basalt], gray --------------	27	242
Rock [basalt], gray, water-bearing	21	263
Shale [clay], green --------------	23	286
Shale [clay], green --------------	12	298
Rock [basalt], soft, porous; clay, water-bearing ------------------	13	311
Rock [basalt], gray --------------	19	330

5/20-28R1. Berk Brothers Inc. Altitude about 2400 ft. Drilled by Gib King Well Drilling, 1969. Cased to 110 ft.

Material	Thickness (ft)	Depth (ft)
Soil ----------------------------	3	3
Boulders, trace of water ----------	91	94
Shale [clay] ---------------------	25	119
Clay -----------------------------	6	125
Clay; gravel ---------------------	20	145
Rock [basalt] --------------------	43	188
Rock [basalt]; clay --------------	11	199
Rock [basalt] --------------------	44	243
Rock [basalt], water-bearing ------	30	273
Clay -----------------------------	33	306
Shale [clay], green, water-bearing	5	311
Rock [basalt] --------------------	10	321
Rock [basalt]; shale [clay] -------	14	335
Basalt ---------------------------	65	400
Rock [basalt], broken, water-bearing -----------------------	8	408
[Unknown] ------------------------	2	410

5/21-3J1. Tom Gray. Altitude about 2378 ft. Driller unknown, 1968.

Material	Thickness (ft)	Depth (ft)
Soil ----------------------------	2	2
Shale [clay] ---------------------	17	19
Basalt ---------------------------	31	50
Shale [clay] ---------------------	8	58
Basalt ---------------------------	47	105
Cinders [basalt] -----------------	1	106

(continued)

Material	Thickness (ft)	Depth (ft)
5/21-3J1. Continued.		
Shale [clay] ---------------------	4	110
Basalt, fractured ----------------	93	203
Basalt, vesicular, water-bearing --	4	207

5/22-27A2. A. M. Matsen. Altitude about 1100 ft. Drilled by Moore and Anderson, 1971. Cased to 144 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil --------------------------	3	3
Basalt, fractured ----------------	6	9
Basalt, fractured ----------------	3	12
Rock [basalt], gray --------------	42	54
Clay -----------------------------	87	141
Rock [basalt], gray --------------	16	157
Rock [basalt], gray, SWL 42' ------	113	270
Basalt, fractured ----------------	9	279
Clay, green ----------------------	70	349
Rock [basalt], black, water-bearing, SWL 62' ----------------	15	364
Rock [basalt], gray, SWL 50' ------	4	368
Rock [basalt], black -------------	216	584
Clay, green ----------------------	34	618
Rock [basalt], black, SWL 53' -----	36	654
Rock [basalt], gray, SWL 55' ------	19	673
Basalt, black, SWL 150' ----------	11	684
Rock [basalt], gray, SWL 30' ------	69	753
Rock [basalt], black, water-bearing, SWL 30' ----------------	14	767
Rock [basalt], gray --------------	39	806
Rock [basalt], black, water-bearing, SWL 27' ----------------	124	930
Rock [basalt], gray --------------	15	945
Rock [basalt], brown, SWL 25' -----	13	958
Rock [basalt], gray, SWL 27' ------	103	1061

5/23-3A2. Robert J. Peterson. Altitude about 720 ft. Drilled by Crowe Drilling Co., 1968. Cased to 79 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil; gravel ------------------	50	50
Clay, yellow ---------------------	5	55

(continued)

Material	Thickness (ft)	Depth (ft)
5/23-3A2. Continued.		
Basalt, black	15	70
Basalt, vesicular, water-bearing	10	80
Basalt, gray	155	235
Basalt, fractured	5	240
Clay, blue	42	282
Sandstone, white	16	298
Basalt; clay	17	315
Basalt, porous, black	6	321
Basalt; clay	51	372
Cinders [basalt], red	7	379
Basalt, fractured, black	33	412
Sandstone, white	4	416
Basalt, black	4	420
Basalt, hard, gray	436	856
Basalt, black	15	871
Lava [basalt], porous, black	14	885
Clay, blue	90	975
5/23-3L1. Robert J. Petersen. Altitude about 820 ft. Drilled by Elmer H. Altman, 1956. Cased to 132 ft.		
Soil	1	1
Rock [basalt]	57	58
Clay; boulders	9	67
Clay; gravel	13	80
Clay, gray	17	97
Clay, blue-gray	28	125
Rock [basalt], broken, black	7	132
Rock [basalt], black	10	142
Rock [basalt], very hard	5	147
Rock [basalt], broken	3	150
5/23-35C1. Mercer Bros. Altitude about 635 ft. Driller unknown, 1975. Cased to 166 ft.		
Sand	15	15
Conglomerate [gravel]	13	28
Basalt	10	38
Clay, brown	4	42

(continued)

Material	Thickness (ft)	Depth (ft)
5/23-35C1. Continued.		
Basalt	78	120
Sand, fine	45	165
Lava [basalt], gray	45	210
Basalt	4	214
Basalt, vesicular, water-bearing	52	266
6/10-25M1. Walt Armstrong. Altitude about 1730 ft. Drilled by Triangle Drilling, 1974. Cased to 224 ft.		
Soil	9	9
Basalt, hard, gray	16	25
Basalt, red	35	60
Basalt, hard, gray	12	72
Basalt, red	118	190
Basalt, vesicular, hard, gray	34	224
6/12-2E1. D. Lloyd. Altitude about 1950 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 22 ft.		
Clay, sandy, brown	5	5
Clay, brown	3	8
Basalt, vesicular, fractured, red; clay	14	22
6/12-3M3. Frank Ward. Altitude about 1981 ft. Drilled by Swift Water Well Drilling, 1973. Cased to 54 ft.		
Sand; clay; gravel	3	3
Sand; gravel	9	12
Sand; gravel	30	42
Sand; gravel	9	51
Basalt, hard, black	11	62
Basalt, hard, light gray	14	76
Basalt, fractured, gray	6	82
Basalt, fractured, water-bearing	14	96

6/12-10K1. Glenwood School. Altitude about 1900 ft. Drilled by Albert Kastl.

Material	Thickness (ft)	Depth (ft)
Clay; sand; gravel	35	35
Basalt, fractured	97	132
Pumice [basalt], soft, red	18	150
Pumice [basalt], soft, red	75	225
Basalt, soft, gray	10	235
Basalt, soft, black	10	245
Basalt	10	255

6/12-22L1. Paul Ladiges. Altitude about 1833 ft. Drilled by Charles Jeter. Cased to 84 ft.

Material	Thickness (ft)	Depth (ft)
Clay; sand	84	84
Basalt	156	240
Gravel; sand, water-bearing	20	260

6/12-27D1. E. W. Ziegler. Altitude about 1828 ft. Drilled by Jack L. Harrison. Cased to 47 ft.

Material	Thickness (ft)	Depth (ft)
Shale [clay], soft	47	47
Basalt, hard	153	200
Lava rock [basalt]	45	245
Sand; gravel, water-bearing	2	247

6/20-4M1. J. C. Ingram. Altitude about 3260 ft. Drilled by O'Leary Well Drilling, Inc., 1971. Cased to 35 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	10	10
Clay, brown	8	18
Clay, brown, water-bearing	9	27
Shale [clay], hard, brown	7	34
Basalt, fractured, gray	8	42
Clay, brown	1	43
Basalt, fractured	12	55
Shale [clay], brown	7	62
Clay, brown and green	6	68
Clay, green and brown	6	74

(continued)

6/20-4M1. Continued.

Material	Thickness (ft)	Depth (ft)
Basalt, fractured	15	89
Basalt, vesicular, gray; clay, water-bearing	14	103
Basalt, fractured	27	130

6/20-13H2. F. Naught. Altitude about 2860 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 25 ft.

Material	Thickness (ft)	Depth (ft)
Clay	3	3
Lava [basalt]; clay	2	5
Basalt, hard, brown	3	8
Clay, brown	11	19
Basalt, red; clay	2	21
Clay	3	24
Basalt	2	26
Basalt, fractured, water-bearing	2	28
Basalt, blue	15	43
Basalt, fractured; clay	37	80
Basalt, gray	25	105
Basalt, fractured; clay	46	151
Basalt, vesicular	4	155
Basalt	9	164
Basalt, fractured, blue	14	178
Basalt, blue	126	304
Basalt, gray	68	372
Sandstone, water-bearing, 58 gpm	3	375

6/20-21A4. Laurence D. Whitmore. Altitude about 3030 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 19 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	15	15
Basalt, gray	119	134
Claystone, brown, black and gray	37	171
Basalt, black	42	213
Basalt, fractured, vesicular; shale [clay], water-bearing	22	235

6/20-22D2. Laurence D. Whitmore, Altitude about 3002 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 22 ft.

Material	Thickness (ft)	Depth (ft)
Clay, brown	9	9
Basalt, gray	17	26
Basalt, vesicular, fractured, brown	15	41
Basalt, gray	92	133
Basalt, vesicular; shale [clay], brown, water-bearing	37	170
Basalt, gray	5	175

6/20-30M1. Matsen Land & Livestock. Altitude about 3120 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 19 ft.

Material	Thickness (ft)	Depth (ft)
Clay	16	16
Basalt, brown and gray	107	123
Basalt, fractured, gray; clay	4	127
Basalt, vesicular	29	156
Claystone, white	13	169
Basalt, vesicular, black, water-bearing	7	176
Claystone, brown	1	177
Basalt, vesicular	13	190

6/20-30Q2. Chet Shannon. Altitude about 3040 ft. Drilled by O'Leary Well Drilling, Inc., 1974. Cased to 63 ft.

Material	Thickness (ft)	Depth (ft)
Clay; sand; gravel	22	22
Claystone, brown	36	58
Basalt, vesicular; clay, water-bearing	27	85

6/20-36B1. Howard Coleman. Altitude about 2780 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 7 ft.

Material	Thickness (ft)	Depth (ft)
Topsoil	5	5
Basalt, vesicular	10	15
Shale [clay], brown	5	20

(continued)

6/20-36B1. Continued.

Material	Thickness (ft)	Depth (ft)
Shale [clay], red	7	27
Basalt, brown and gray	11	38
Basalt, gray	24	62
Basalt, brown	7	69
Basalt, gray	21	90
Basalt, brown	4	94
Basalt, gray	22	116
Claystone, red and yellow	3	119
Claystone, red; basalt	7	126
Basalt	4	130
Basalt, fractured, blue	10	140
Basalt, fractured, brown	3	143
Basalt, fractured, blue	25	168
Basalt, gray	167	335
Basalt, gray	1	336
Claystone, green and blue	4	340
Claystone, blue and green	4	344
Claystone, green and blue	21	365
Basalt, vesicular, red; sand; gravel	10	375
Basalt, fractured, gray	15	390
Sandstone, hard, gray	18	408

6/21-15L2. L. Giles. Altitude about 2580 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 19 ft.

Material	Thickness (ft)	Depth (ft)
Clay, sandy, brown	8	8
Basalt, fractured, black; clay	199	207
Basalt, vesicular, fractured, water-bearing	13	220

6/21-19Q1. Bud Matsen. Altitude about 2787 ft. Driller unknown, 1974. Cased to 53 ft.

Material	Thickness (ft)	Depth (ft)
Clay; boulders	48	48
Basalt, gray	290	338
Basalt, gray; clay	43	381
Basalt, vesicular, brown	319	700
Basalt, vesicular; clay	6	706

(continued)

Material	Thickness (ft)	Depth (ft)
6/21-19Q1. Continued.		
Basalt, gray ----------------------	145	851
Basalt, fractured, black ----------	5	856
Basalt ---------------------------	9	865

6/21-28D1. Elwood Brown. Altitude about 2670 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 19 ft.

Clay, brown -----------------------	4	4
Basalt, gray; shale [clay] --------	103	107
Basalt, fractured, brown ----------	16	123
Basalt, gray ----------------------	170	293
Basalt, fractured, gray; clay -----	17	310

6/21-31F3. Howard Coleman. Altitude about 2741 ft. Drilled by Gorge Contractors, Inc., 1969. Cased to 5 ft.

Topsoil ---------------------------	3	3
Basalt, gray ----------------------	75	78
Shale [clay], brown ---------------	2	80
Basalt, black ---------------------	32	112
Basalt; clay ----------------------	65	177
Basalt; clay ----------------------	25	202
Basalt, porous --------------------	6	208
Basalt, fractured; clay -----------	26	234
Basalt, gray ----------------------	6	240
Basalt, porous --------------------	17	257
Basalt, black ---------------------	54	311
Claystone, blue and gray ----------	40	351
Basalt, black; clay ---------------	7	358
Shale [clay], brown ---------------	8	366
Basalt; clay ----------------------	19	385
Claystone, blue and green ---------	7	392
Basalt, gray ----------------------	23	415

6/21-35P1. Tom Gray. Altitude about 2360 ft. Drilled by O'Leary Well Drilling, Inc., 1973. Cased to 78 ft.

Clay ------------------------------	67	67

(continued)

Material	Thickness (ft)	Depth (ft)
6/21-35P1. Continued.		
Basalt, fractured, vesicular, gray	12	79
Basalt, gray ----------------------	61	140
Clay ------------------------------	4	144
Basalt, fractured, gray -----------	156	300

6/23-11Q1. Robert Andrews. Altitude about 1020 ft. Drilled by Moore and Anderson, 1957. Cased to 150 ft.

Topsoil ---------------------------	7	7
Gravel ----------------------------	69	76
Clay, red -------------------------	15	91
Rock [basalt], brown --------------	55	146
Basalt, gray ----------------------	8	154
Rock [basalt?], light yellow, water-bearing -------------------	54	208

6/23-15H1. Robert Andrews. Altitude about 1050 ft. Drilled by Moore and Anderson, 1967. Cased to 128 ft.

Topsoil ---------------------------	3	3
Clay ------------------------------	2	5
Rock [basalt] ---------------------	3	8
Rock [basalt], hard ---------------	5	13
Rock [basalt], brown --------------	9	22
Rock [basalt], brown with black ---	6	28
Rock [basalt], hard, gray ---------	2	30
Rock [basalt], gray ---------------	22	52
Rock [basalt], greenish-brown -----	14	66
Rock [basalt], brown --------------	2	68
Rock [basalt], brown --------------	2	70
Rock [basalt], brownish-black -----	12	82
Clay, gray ------------------------	29	111
Rock [basalt], black --------------	2	113
Rock [basalt], black and gray -----	25	138
Rock [basalt], gray ---------------	22	160
Rock [basalt], gray ---------------	93	253
Rock [basalt], hard, gray ---------	5	258
Rock [basalt], gray ---------------	4	262
Basalt, gray ----------------------	24	286

(continued)

Material	Thickness (ft)	Depth (ft)
6/23-15H1. Continued.		
Rock [basalt]; clay ---------------	7	293
Clay, yellow ---------------------	10	303
Rock [basalt], brown-gray ---------	10	313
Rock [basalt], brown, SWL 101' ----	38	351
Rock [basalt], hard, blackish-brown --------------------------	11	362
Rock [basalt], gray ---------------	6	368
Rock [basalt], gray-brown ---------	9	377
Rock [basalt], blackish-brown, water-bearing, SWL 103' ---------	28	405
Rock [basalt], gray-black ---------	33	438
Rock [basalt], dark gray ----------	44	482
Rock [basalt], gray ---------------	8	490
Rock [basalt]; clay ---------------	47	537
Clay, green, SWL 103' -------------	22	559
Rock [basalt], black --------------	15	574
Rock [basalt], blackish-brown, SWL 77' -----------------------	9	583
Rock [basalt], brown, SWL 45' -----	5	588
Rock [basalt], brownish-black, SWL 37' -----------------------	5	593
Rock [basalt], black-brown, SWL 14'	2	595
Rock [basalt], black, SWL 11' to 1'	29	624
Rock [basalt], gray ---------------	9	633
Basalt, gray ---------------------	25	658
Basalt, black --------------------	17	675
Basalt, gray, 500 gpm ------------	163	838
Basalt, black, water-bearing, 2200 gpm -----------------------	100	938
Basalt, gray ---------------------	12	950

APPENDIX D

Monthly Water-Level Measurements in Selected Observation Wells, Klickitat County, Washington

Date		Depth of water (ft)

3/15-20H1. Henry Miller. Elevation 1570 feet.

Date		Depth of water (ft)
1975		
April	16	1.56
May	9	2.00
June	19	3.30
July	22	4.40
August	14	5.45
September	15	6.30
October	14	5.15
November	18	4.38
December	10	2.78
1976		
January	27	1.72
February	12	1.85
March	18	1.60
April	20	1.80
May	18	2.95
June	15	3.80
July	21	4.70
August	17	5.65
September	14	6.24

3/15-22H2. Dept. of Natural Res. Elevation 1590 feet. Well depth 616 feet.

Date		Depth of water (ft)
1975		
April	16	2.60
May	9	4.35
June	19	8.60
August	14	9.60
September	15	11.30
October	14	9.20
November	18	8.30
December	10	8.25
1976		
January	27	4.26
February	12	3.75
March	18	2.70
April	20	2.65
May	18	9.50

3/15-28A1. Frank Garner. Elevation 1695 feet. Well depth 85 feet.

Date		Depth of water (ft)
1957		
August	21	13.90
October	23	14.31
December	15	14.13
1958		
February	29	12.14
April	24	11.72
June	24	12.67
August	21	13.45
October	23	15.09
December	15	13.85
1959		
February	24	10.31
April	21	11.78
June	23	12.01
August	24	14.07
October	24	14.38
November	27	14.48

(continued)

Date		Depth of water (ft)
3/15-28A1. Continued.		
1960		
March	25	13.10
May	23	13.23
July	28	14.59
October	6	15.29
December	3	15.41
1961		
January	28	13.53
March	21	12.03
July	27	13.48
September	24	15.73
December	2	14.52
1962		
January	23	13.04
March	19	12.61
May	21	12.15
July	31	12.06
September	18	14.43
December	1	15.69
1963		
January	23	13.87
April	2	12.02
May	27	12.58
July	29	13.90
October	2	14.73
November	25	14.12
1964		
March	17	13.11
May	26	13.19

Date		Depth of water (ft)
July	23	13.32
September	23	15.25
1965		
April	8	6.86
May	7	10.99
June	16	11.64
July	30	12.71
September	17	13.52
October	12	13.67
November	16	13.74
1966		
January	11	14.10
February	16	12.35
March	29	12.08
May	9	12.45
June	20	13.32
August	2	14.12
September	16	14.75
November	1	14.95
December	15	14.52
1967		
January	24	13.86
March	7	13.19
April	13	13.15
June	6	13.79
July	17	14.67
August	30	16.44
October	16	15.79
December	4	15.55

(continued)

Date		Depth of water (ft)
3/15-28A1. Continued.		
1968		
January	17	15.37
March	4	13.74
April	9	13.30
June	4	14.25
July	17	15.20
September	3	15.99
October	14	16.07
December	2	15.77
1969		
January	13	14.06
March	3	12.24
April	17	11.17
June	9	11.95
July	15	13.04
September	9	14.33
October	21	14.67
1970		
January	13	14.22
March	18	10.54
April	13	10.50
June	4	11.49
July	14	12.64
August	26	13.88
October	5	14.41
November	20	14.16
December	24	13.83
1971		
February	26	11.42
April	5	10.73

Date		Depth of water (ft)
May	29	10.46
July	9	12.35
August	16	13.72
October	8	14.54
November	18	14.62
1972		
January	4	14.23
March	10	11.38
April	28	11.18
June	16	12.32
August	4	13.96
September	21	14.60
November	16	14.84
1973		
January	11	13.67
March	7	12.20
April	30	12.61
June	26	14.89
August	20	16.71
October	15	17.18
1974		
March	12	9.27
October	17	13.91
1975		
March	18	9.40
September	18	13.60

Date		Depth of water (ft)
3/15-29G1. Dept. of Natural Res. Elevation 1615 feet. Well depth 900 feet.		
1975		
March	11	123.14
April	16	124.02
May	9	124.49
June	19	126.30
July	22	128.67
August	14	128.45
September	15	128.60
October	14	128.40
November	18	127.65
December	10	125.15
1976		
January	27	124.51
February	12	124.55
March	18	124.05
April	20	124.05
May	18	129.60
June	15	124.55
July	21	124.85
August	17	125.92
September	14	126.35
3/16-20B1. Paul Dooley. Elevation 1710 feet. Well depth 138 feet.		
1975		
August	15	79.49
September	15	82.74
October	14	84.04
November	18	79.94
December	10	79.39
1976		
January	27	78.68
February	12	83.49
March	18	78.74
April	20	82.90
May	18	79.09
June	15	77.99
July	21	79.04
August	17	79.81
September	14	79.94
3/19-7G1. Bob Imrie. Elevation 1435 feet. Well depth 298 feet.		
1975		
August	15	245.80
September	16	244.95
October	15	244.75
November	18	245.45
December	10	244.15
1976		
January	28	244.00
February	11	243.40
March	18	246.60
April	20	246.30
May	19	242.55
June	18	245.40
July	21	245.60
August	18	245.55
September	13	247.12

Date		Depth of water (ft)
3/19-23J1. Ed Morris. Elevation 1018 feet. Well depth 140 feet.		
1975		
March	14	127.20
April	15	126.86
May	9	127.00
June	20	126.91
July	22	133.60
August	16	132.20
September	16	130.35
October	15	135.55
November	18	133.89
December	11	126.55
1976		
January	28	126.48
February	11	129.60
March	18	125.90
April	20	126.20
May	19	126.60
June	18	126.70
July	21	126.70
August	18	131.83
September	13	133.35
3/20-7F1. Horace White. Elevation 830 feet. Well depth 265 feet.		
1975		
April	15	23.92
May	9	24.10
June	20	25.70
July	22	27.20
August	15	27.25
September	16	28.30
October	15	29.79
November	18	29.75
December	11	28.90
1976		
January	28	26.35
February	11	26.50
March	18	24.40
April	20	24.50
May	19	25.10
June	18	25.90
July	21	26.90
August	18	28.20
September	13	28.78
3/20-13R1. Dewey Beeks. Elevation 405 feet. Well depth 260 feet.		
1975		
August	15	168.45
September	16	167.60
October	15	167.15
November	18	167.40
December	9	166.50
1976		
January	28	166.28
February	11	166.05
March	18	164.95

(continued)

Date		Depth of water (ft)
3/20-13R1. Continued.		
April	20	161.75
May	19	166.70
June	15	164.80
July	21	166.40
August	18	167.60
September	13	167.57

4/10-24J2. Robert Jarvis. Elevation 540 feet. Well depth 93 feet.

Date		Depth of water (ft)
1975		
April	15	16.69
May	9	17.68
June	19	18.87
July	22	19.33
August	14	19.95
September	15	19.84
October	14	20.35
November	17	19.25
December	10	16.55
1976		
January	27	17.65
February	12	17.50
March	19	16.20
April	21	17.15
May	18	18.25
June	15	18.60
July	22	19.70
August	18	20.37
September	14	19.10

4/15-13K2. Claude Knight. Elevation 1645 feet. Well depth 520 feet.

Date		Depth of water (ft)
1975		
March	11	15.92
April	14	15.29
May	9	15.15
June	23	22.11*
July	22	23.65*
August	14	23.75*
September	15	23.17*
October	14	25.60
November	18	22.75
December	10	21.40
1976		
January	27	18.88
February	12	18.70
March	18	17.40
April	20	16.85
May	18	16.65
June	16	18.40
July	23	22.90
August	17	23.95
September	14	22.04

4/15-16F1. Dept. of Ecology, Blockhouse Observation Well. Elevation 1595 feet. Zone A (40-210 feet).

Date		Depth of water (ft)
1973		
March	16	19.00

(continued)

* Pumping of nearby well may have affected measurement.

Date		Depth of water (ft)
4/15-16F1. Continued.		
April	30	13.60
June	29	14.50
August	24	15.90
October	19	14.80
December	4	13.20
1974		
January	23	12.50
March	5	12.00
May	3	11.60
June	27	12.80
August	23	16.00
October	17	15.90
December	12	14.20
1975		
February	4	14.10
April	3	14.30
April	15	14.15
May	9	13.35
May	27	13.20
June	19	13.60
July	22	14.55
July	24	14.40
August	14	15.35
September	15	15.50
September	18	15.40
October	14	15.60
November	18	14.55
December	10	14.35
1976		
January	27	13.10
February	12	11.45
March	18	11.35
April	20	11.45
May	18	11.50
June	15	12.70
July	21	15.95
August	17	17.40
September	14	18.09

Date		Depth of water (ft)
4/15-16F1. Zone B (215-330 feet).		
1973		
March	16	18.50
April	30	13.60
June	29	14.50
August	24	15.80
October	19	14.90
December	4	13.20
1974		
January	23	12.40
March	5	11.90
May	3	11.70
June	27	13.00
August	23	15.90
October	17	15.80
December	12	14.60
1975		
February	4	14.00

(continued)

Date		Depth of water (ft)
4/15-16Fl. Continued.		
April	3	14.20
April	15	14.10
May	27	13.40
June	19	13.62
July	22	14.44
July	24	14.40
August	14	15.45
September	15	15.65
September	18	15.40
October	14	15.55
November	18	14.40
December	10	14.40
1976		
January	27	12.95
February	12	11.45
March	18	11.30
April	20	11.35
May	18	11.50
June	15	12.70
July	21	15.85
August	17	17.67
September	14	18.15

4/15-16Fl. Zone C (335-440 feet).

Date		Depth of water (ft)
1973		
March	16	19.00
April	30	14.00
June	29	15.00
August	24	15.20
October	19	15.50
December	4	13.70
1974		
January	23	13.00
March	5	12.70
May	3	12.30
June	27	13.60
August	23	16.60
October	17	16.60
December	12	15.20
1975		
February	4	14.70
April	3	14.90
April	15	14.77
May	9	13.95
May	27	14.00
June	19	14.15
July	22	15.02
July	24	15.00
August	14	16.05
September	15	16.15
September	18	16.00
October	14	16.15
November	18	15.00
December	10	15.01
1976		
January	27	13.45
February	12	12.00
March	18	11.80
April	20	11.85

(continued)

Date		Depth of water (ft)
4/15-16F1. Continued.		
May	18	12.05
June	15	13.20
July	21	16.55
August	17	17.91
September	14	18.75

4/15-16F1. Zone D (500-580 feet).

Date		Depth of water (ft)
1973		
March	16	219.10
April	30	223.60
June	29	219.70
August	24	217.60
October	19	215.30
December	4	212.40
1974		
January	23	210.70
March	5	209.20
May	3	207.20
June	27	207.40
August	23	207.70
October	17	206.80
December	12	205.70
1975		
February	4	205.30
April	3	204.60
April	15	204.40
May	9	204.15
May	27	203.50
June	19	203.90
July	22	204.04
July	24	204.10
August	14	204.55
September	15	203.40
September	18	203.90
October	14	203.00
November	18	202.55
December	10	201.45
1976		
January	27	201.10
February	12	199.45
March	18	201.45
April	20	200.95
May	18	201.15
June	15	198.95
July	21	201.35
August	17	203.05
September	14	203.05

4/16-20G1. Boise Cascade. Elevation 1610 feet. Well depth 115 feet.

Date		Depth of water (ft)
1975		
March	11	3.65
April	14	4.16
May	9	5.02
June	19	6.90
July	21	8.60
August	14	9.15

(continued)

Date		Depth of water (ft)
4/16-20G1. Continued.		
September	15	9.85
October	14	9.28
November	18	6.92
December	10	5.14
1976		
January	27	4.09
February	12	4.40
March	18	3.50
April	20	4.20
May	18	5.20
June	15	6.30
July	21	8.55
August	17	8.65
September	13	8.47

4/16-21B1. Johnnie Foster. Elevation 1660 feet. Well depth 115 feet.

Date		Depth of water (ft)
1975		
March	13	23.60
April	15	22.90
May	9	23.40
June	19	27.42
July	21	29.70
August	14	30.85
September	15	31.40
October	14	31.20
November	18	29.45
December	10	27.95
1976		
January	27	25.30
February	12	24.65
March	18	23.25
April	20	23.50
May	18	25.05
June	15	28.70
July	21	31.90
August	17	32.70
September	13	32.93

4/17-28H1. Jim Schuster. Elevation 1935 feet. Well depth 500 feet.

Date		Depth of water (ft)
1975		
October	14	65.90
November	18	64.30
December	10	62.20
1976		
January	27	58.75
February	11	57.95
March	18	56.10
April	21	55.31
May	19	54.75
June	17	62.80
July	21	63.30
August	18	64.53
September	13	68.70

Date		Depth of water (ft)
4/17-31L1. T. V. Wilkins. Elevation 1883 feet. Well depth 139 feet.		
1957		
August	21	6.75
October	23	5.86
December	15	5.63
1958		
April	24	4.26
June	24	4.57
August	21	6.58
October	23	6.35
1959		
February	24	8.79
April	21	5.41
June	23	5.57
August	24	7.63
October	24	6.06
November	27	6.07
1960		
March	25	4.02
May	23	3.93
July	28	6.49
October	6	6.15
December	3	6.33
1961		
January	28	3.55
July	27	5.60
September	24	7.10
December	2	5.73
1962		
January	23	5.12
March	19	4.70
May	21	4.27
July	31	4.28
September	18	5.01
December	1	5.17
1963		
January	21	3.76
April	1	3.43
May	27	4.09
July	29	4.93
October	2	5.39
November	25	5.11
1964		
March	17	4.97
May	26	4.89
July	23	5.11
September	23	5.74
1965		
April	8	3.18
May	7	3.96
June	16	4.58
July	30	5.29
September	17	5.05
October	12	4.85
November	16	4.70

(continued)

Date		Depth of water (ft)
4/17-31L1. Continued.		
1966		
January	11	2.11
February	16	0.99
March	29	3.14
May	9	4.00
June	20	4.57
August	2	5.26
September	15	5.50
November	1	5.32
December	15	2.85
1967		
January	24	2.74
March	7	3.59
April	13	4.18
June	6	5.10
July	17	5.94
August	30	6.40
October	16	6.01
December	4	5.82
1968		
January	17	3.90
March	4	3.14
April	9	4.65
June	4	5.65
July	17	6.60
September	3	6.68
October	14	6.31
December	3	4.90

Date		Depth of water (ft)
1969		
January	14	4.00
March	3	1.69
April	18	3.10
June	9	4.78
July	15	6.58
September	9	8.01
October	21	6.58
December	11	5.94
1970		
January	13	4.39
March	10	2.55
April	13	3.90
June	4	6.15
July	14	6.75
August	26	7.90
October	5	7.23
November	20	6.01
December	24	4.33
1971		
February	26	3.13
April	5	4.09
May	29	5.71
July	9	6.60
August	16	7.60
October	8	7.21
November	18	6.41
1972		
January	4	4.36
March	10	2.10
April	28	4.20

(continued)

Date		Depth of water (ft)
4/17-31L1. Continued.		
June	16	5.82
August	4	7.44
September	21	7.35
November	16	6.20
1973		
January	11	4.78
March	7	3.31
April	30	5.09
June	26	6.41
August	20	6.78
October	15	6.47
December	4	2.18
1974		
March	12	1.29
October	17	4.90
1975		
March	18	1.07
September	18	4.62

5/17-20N2. Addison Lane. Elevation 2440 feet. Well depth 700 feet.

Date		Depth of water (ft)
1975		
September	3	556.50
September	17	557.40
October	17	557.40
November	18	557.50
December	10	556.75
1976		
January	27	556.90
February	12	556.20
March	18	558.20
April	20	559.00
May	19	558.80

5/23-3A2. Robert J. Peterson. Elevation 720 feet. Well depth 575 feet.

Date		Depth of water (ft)
1975		
August	15	140.55
September	16	141.95
October	15	142.45
November	18	143.30
December	11	141.15
1976		
January	28	141.90
February	3	143.80
March	19	143.50
April	21	143.30
May	19	147.90
June	15	138.60
July	23	128.30
August	19	123.84
September	13	123.70

6/12-10K1. Glenwood School. Elevation 1900 feet. Well depth 255 feet.

(continued)

Date		Depth of water (ft)
6/12-10K1. Continued.		
1974		
February	13	199.90
April	2	194.05
May	8	189.75
June	12	185.14
July	10	180.20
August	14	177.90
September	13	178.61
October	9	181.10
November	13	186.70
December	18	192.78
1975		
January	24	192.70
March	13	198.55
April	15	196.10
May	9	195.65
June	19	193.65
July	22	191.74
August	14	191.75
September	15	192.85
October	14	195.45
November	17	200.40
December	10	202.80
1976		
January	27	204.90
February	12	206.80
March	19	206.65
April	21	203.70
May	18	200.85
June	15	197.40
July	22	192.80
August	18	192.57
September	14	191.83

Date		Depth of water (ft)
6/12-10P1. Ada Conboy. Elevation 1895 feet. Well depth 14 feet.		
1974		
February	11	4.13
April	2	4.91
May	8	6.98
June	12	6.02
July	11	6.00
August	15	6.70
September	12	6.12
October	10	7.34
November	13	9.15
December	18	9.86
1975		
January	24	5.70
March	13	5.49
April	15	7.52
May	9	8.72
June	19	6.05
July	22	6.90
August	14	7.00
September	15	9.15
October	14	11.10
November	17	11.25

(conintued)

Date		Depth of water (ft)
6/12-10P1. Continued.		
December	10	7.10
1976		
January	27	6.94
February	12	8.20
March	19	7.10
April	21	7.70
May	18	8.40
June	15	5.90
July	22	5.80
August	18	6.05
September	14	6.91

6/20-22C1. Roy Van Nostern. Elevation 2990 feet. Well depth 147 feet.

Date		Depth of water (ft)
1975		
March	12	1.80
April	16	2.00
May	9	2.90
June	20	3.88
July	21	4.80
August	15	5.08
September	16	5.55
October	15	6.50
November	18	5.68
December	11	4.05
1976		
January	28	2.09
February	13	2.15
March	19	1.85
April	21	2.35
May	19	2.00
June	15	2.00
July	23	5.40
August	18	5.38
September	13	6.24

6/20-22D1. Lawrence Whitmore. Elevation 3005 feet. Well depth 44 feet.

Date		Depth of water (ft)
1968		
May	31	15.60
July	19	15.76
August	22	24.97
October	1	21.03
November	6	14.43
December	14	12.03
1969		
February	14	12.33
March	19	3.88
May	21	10.85
June	1	11.93
July	1	13.23
August	5	10.93
September	15	13.83
October	7	9.93
November	4	8.93
December	5	22.33

(conintued)

Date		Depth of water (ft)
6/20-22D1. Continued.		
1970		
February	3	6.33
March	4	3.73
April	1	4.83
May	11	5.63
June	4	11.49
July	13	18.88
August	26	25.14
October	5	23.74
November	24	21.02
1971		
February	26	4.40
April	9	3.30
May	30	8.62
July	9	15.70
August	16	23.05
October	8	16.30
November	18	14.92
1972		
January	6	13.75
March	9	25.60
April	28	5.47
June	16	9.10
August	4	14.45
September	21	18.73
November	16	17.33
1973		
January	11	16.10
March	7	13.60
May	4	13.79
June	29	20.72
August	25	31.27
October	19	27.80
December	7	18.90
1974		
March	12	27.50
October	17	31.10
1975		
April	3	25.61
September	26	28.93

6/20-30Q1. Roy Van Nostern. Elevation 3045 feet. Well depth 14 feet.

Date		Depth of water (ft)
1975		
April	16	5.16
May	9	5.60
June	20	11.05
July	21	7.10
August	15	7.50
September	16	7.50
October	15	7.05
November	18	6.04
December	11	4.71
1976		
January	28	4.72
February	13	5.10
March	19	4.55

(continued)

Date		Depth of water (ft)
6/20-30Q1. Continued.		
April	21	5.45
May	19	6.40
June	15	6.80
July	23	7.30
August	18	7.34
September	13	7.54

6/21-31F2. Howard Coleman. Elevation 2740 feet. Well depth 300 feet.

Date		Depth of water (ft)
1975		
August	2	254.85
September	16	264.00
October	15	275.60
November	18	261.70
December	11	259.90
1976		
January	28	269.52
February	13	267.10
March	19	266.60
April	21	265.40
May	19	271.40
June	15	269.50
July	22	277.40
August	18	272.13
September	13	270.25

6/21-31F4. Howard Coleman. Elevation 2738 feet. Well depth 278 feet.

Date		Depth of water (ft)
1975		
April	16	171.85
May	9	174.55
June	20	179.23
July	21	181.29
August	15	181.45
September	16	180.95
October	15	179.80
November	18	180.40
December	11	172.42
1976		
January	28	164.43
February	13	187.80*
March	19	181.80
April	21	185.00
May	19	191.70
June	15	198.05
July	23	196.60
August	18	198.50
September	13	196.60

6/21-34N1. Tom Gray. Elevation 2477 feet. Well depth 104 feet.

Date		Depth of water (ft)
1975		
August	15	52.45
September	16	57.08

(continued)

* Pumping of nearby well may have affected measurement.

Date		Depth of water (ft)
6/21-34N1. Continued.		
October	15	56.20
November	18	57.84
December	11	57.94
1976		
January	28	55.40
February	12	50.70
March	19	56.35
April	20	57.80
May	19	59.55
June	15	60.45
July	23	62.10
August	18	63.70
September	13	64.53

APPENDIX E

Water-Level Measurements from Wells in the Goldendale-Centerville Area, 1974-1975

<u>Location</u>

Refer to Figure 59 for explanation of well location method.

<u>Elevation</u>

In feet above mean sea level. Estimated from U.S.G.S. 15' topographical maps.

<u>SWL</u>

Static Water Level measured as feet below land surface unless preceeded by a + indicating measurement is above land surface.

APPENDIX E

Well Location	Elevation (ft)	1974 SWL (ft)	1974 Date	1974 SWL (ft)	1974 Date	1975 SWL (ft)	1975 Date	1975 SWL (ft)	1975 Date
				T. 3 N. R. 14 E.					
9Q1	1980	5.20	----	6.00	11/19	6.50	4/15	5.42	10/28
12J1	1840	39.19	5/15	38.20	11/20	28.23	4/16	37.38	10/29
14R1	1700	6.14	5/01	8.51	11/19	6.25	4/16	7.25	10/29
24C1	1660	39.41	5/01	37.77	11/19	37.85	4/17	36.65	10/29
24P1	1645	37.08	5/01	-----	-----	36.75	4/15	-----	-----
25C1	1560	19.32	5/01	22.01	11/19	19.00	4/16	20.88	10/29
25M1	1600	13.63	5/01	14.39	11/19	13.68	4/15	14.59	10/29
25R1	1680	98.50	----	98.36	11/19	96.80	4/16	98.10	10/29
26K1	1580	7.02	5/01	8.39	11/19	6.97	4/15	7.21	10/29
28G1	1620	1.02	5/01	4.90	11/19	1.74	4/15	3.86	10/29
28H1	1600	0.62	5/01	4.03	11/19	Flow	4/15	4.24	10/29
29B1	1650	51.95	5/01	55.78	11/20	54.25	4/15	55.34	10/29
				T. 3 N. R. 15 E.					
1R1	1610	13.65	4/30	13.59	11/18	10.43	4/16	12.66	10/28
2M1	1675	28.70	4/30	35.30	11/18	35.60	4/15	34.63	10/29
4H1	1745	16.54	4/30	18.57	11/19	17.35	4/15	19.76	10/29
5L1	1860	3.31	4/30	6.65	11/19	2.95	4/15	Flow	10/27
6Q1	1910	0.47	4/30	3.90	11/19	0.00	4/15	4.45	10/27
7Q1	1650	Flow	4/30	0.60	11/19	Flow	4/15	1.20	10/27

Well Location	Elevation (ft)	1974 SWL (ft)	1974 Date	1974 SWL (ft)	1974 Date	1975 SWL (ft)	1975 Date	1975 SWL (ft)	1975 Date
7Q2	1670	34.66	4/30	36.70	11/19	34.82	4/15	33.10	10/27
11C1	1625	5.90	5/01	7.90	11/18	7.95	4/15	8.23	10/29
11C2	1625	1.70	5/01	4.25	11/18	4.35	4/15	4.60	10/29
11M1	1610	35.50	5/01	29.15	11/18	36.00	4/15	43.00	10/29
11N2	1595	10.30	4/30	29.70	-----	13.85	4/15	30.00	10/29
12A1	1600	2.28	4/30	6.77	11/18	2.40	4/16	7.55	10/28
13A1	1595	26.25	5/02	31.30	11/18	26.12	4/14	34.59	10/28
13B1	1595	3.37	5/02	7.83	11/18	3.21	4/14	8.10	10/28
13C1	1595	7.41	5/02	12.14	11/18	7.52	4/14	12.33	10/28
14B1	1590	10.10	5/30	15.30	11/18	10.65	----	14.80	10/29
15A1	1595	22.70	4/30	26.89	11/18	22.24	4/15	27.16	10/29
15A2	1595	9.39	4/30	18.90	11/18	12.90	4/15	22.34	10/29
15B1	1595	14.89	5/02	19.56	11/20	14.97	4/15	19.90	10/28
17C1	1635	4.17	4/30	-----	-----	2.21	4/15	4.61	10/28
17Q1	1595	14.00	----	16.88	11/19	11.36	4/15	15.64	10/28
18Q1	1600	37.00	----	42.16	11/19	38.90	4/15	43.15	10/28
19A1	1585	17.25	----	21.30	11/19	17.22	4/15	22.20	10/28
19J1	1565	1.60	----	5.78	11/19	1.57	4/15	5.74	10/28
20H1	1570	3.10	5/02	3.84	11/19	0.79	4/15	3.84	10/28
20J1	1570	8.50	----	11.66	11/19	7.74	4/15	11.60	10/28
20L1	1560	Flow	----	+1.57	11/19	Flow	4/15	+1.58	10/28
22H1	1600	36.10	----	41.02	11/18	36.56	4/15	41.11	10/28

Well Location	Elevation (ft)	1974 SWL (ft)	Date	SWL (ft)	Date	1975 SWL (ft)	Date	SWL (ft)	Date
22H2	1590	4.45	----	6.83	11/18	-----	----	7.06	10/28
22R1	1615	28.40	4/30	33.67	11/18	28.40	4/16	34.05	10/28
26B1	1635	38.70	----	48.75	11/19	44.84	4/15	49.15	10/28
28M1	1630	51.15	----	52.97	11/19	46.58	4/15	51.94	10/28
28M2	1630	35.30	----	41.74	11/19	36.40	4/15	43.98	10/28
29G1	1615	112.80	----	121.42	11/19	-----	----	128.00	10/28
34H1	1740	40.00	5/01	46.20	11/19	44.43	4/15	44.56	10/28
			T. 3 N.	R. 16 E.					
1C1	1840	32.50	5/01	16.73	11/18	13.27	4/16	16.68	10/29
1P1	1920	73.10	5/01	71.06	11/18	71.01	4/16	71.01	10/29
3B1	1750	19.23	4/29	24.11	11/19	19.66	4/16	23.01	10/29
3F1	1730	31.45	4/29	40.77	11/19	23.45	4/16	-----	-----
4E1	1710	71.95	5/01	49.41	11/19	45.63	4/16	47.21	10/29
4H1	1680	51.35	4/29	37.66	11/20	32.15	4/16	32.95	10/28
4P1	1680	14.85	5/01	17.14	11/19	14.25	4/16	14.53	10/29
7E1	1615	37.67	4/30	41.64	11/18	37.55	4/16	51.93	10/28
7H1	1630	27.10	4/30	29.97	11/18	26.80	4/16	32.45	10/28
7P1	1590	5.67	5/02	9.70	11/18	5.28	4/16	9.13	10/28
7Q1	1590	8.42	5/02	10.62	11/18	10.62	4/16	9.52	10/27
8J1	1660	33.50	4/30	39.55	11/18	34.30	4/15	44.68	10/27
8K1	1630	20.85	4/30	27.60	11/18	21.50	4/16	32.33	10/28

Well Location	Elevation (ft)	1974 SWL (ft)	1974 Date	1974 SWL (ft)	1974 Date	1975 SWL (ft)	1975 Date	1975 SWL (ft)	1975 Date
8K2	1630	15.96	4/30	22.15	11/18	16.88	4/16	26.43	10/28
8Q1	1640	21.05	4/30	24.93	11/18	22.40	4/16	28.67	10/27
9C1	1650	29.25	4/30	32.80	11/19	29.27	4/16	31.69	10/29
9E1	1645	20.70	4/29	21.05	11/19	15.98	4/16	22.91	10/29
18D1	1590	11.02	5/02	14.56	11/18	10.72	4/14	17.49	10/28
18D2	1610	12.28	5/02	16.85	11/18	11.92	4/14	17.64	10/28
18E1	1610	12.56	4/30	-----	-----	-----	----	-----	-----
18P1	1640	59.00	4/30	70.34	11/18	60.80	4/14	68.57	10/28
18Q1	1640	68.65	----	72.10	11/18	67.38	4/14	71.57	10/28
20B1	1710	80.51	5/02	79.84	11/18	79.52	4/14	79.86	10/28
20D1	1680	91.72	5/02	104.58	11/18	90.97	4/14	95.97	10/28
30F1	1800	28.07	5/02	32.01	11/18	-----	----	32.82	10/28
			T. 3 N.	R. 17 E.					
5B1	1925	29.46	4/30	35.95	11/18	22.53	4/16	65.15	10/28
5P1	1960	88.08	4/30	89.50	11/18	79.13	4/16	104.72	10/28
9Q1	2400	5.20	----	6.00	11/19	-----	----	-----	-----
			T. 4 N.	R. 14 E.					
1A1	1640	24.44	5/01	27.03	11/19	24.46	4/15	27.26	10/29
2B1	1440	25.05	5/02	29.82	11/19	28.30	4/15	32.35	10/29
25G1	1560	34.92	5/02	36.65	11/19	35.40	4/16	37.56	10/27

Well Location	Elevation (ft)	1974 SWL (ft)	Date	SWL (ft)	Date	1975 SWL (ft)	Date	SWL (ft)	Date
26K1	1560	123.25	4/29	122.25	-----	121.55	4/16	123.00	10/27
			T. 4 N. R. 15 E.						
1F1	1815	115.25	4/30	120.54	11/20	115.40	4/16	120.27	10/28
2F1	1760	11.97	4/29	25.53	11/20	11.53	4/16	24.25	10/28
2J1	1790	106.25	4/29	113.58	11/21	105.05	4/16	111.56	10/28
2L1	1720	0.00	4/30	0.00	11/20	0.00	4/16	0.00	10/28
2N1	1685	Flow	4/30	-----	-----	Flow	4/16	Flow	10/28
2N2	1680	37.98	4/30	40.77	11/20	39.41	4/16	45.68	10/28
3H1	1725	64.88	5/01	67.71	11/20	65.00	4/16	71.70	10/28
4P2	1665	32.14	5/01	-----	-----	28.30	4/15	39.50	10/29
4P3	1670	21.79	5/01	38.42	11/20	28.61	4/15	38.97	10/28
4R1	1680	31.23	4/30	36.42	11/30	29.60	4/15	39.54	10/28
5A1	1700	47.05	5/01	50.83	11/18	53.57	4/15	54.06	10/28
5E1	1675	-----	----	48.74	11/20	2.05	4/16	-----	-----
5L1	1660	42.71	5/01	45.33	11/20	42.32	4/14	43.51	10/28
8C1	1660	90.04	5/01	87.40	11/18	84.80	4/15	94.83	10/28
8R1	1590	3.62	5/01	4.81	11/18	9.85	4/15	5.11	10/28
9C1	1660	7.05	5/01	11.62	11/18	8.85	4/15	11.91	10/27
9F1	1630	0.50	5/01	0.58	11/18	+0.26	4/15	-----	-----
10F1	1660	21.68	4/30	23.90	11/18	22.24	4/14	27.96	10/28
10J1	1660	9.16	4/30	11.01	11/19	9.24	4/14	11.43	10/27

Well Location	Elevation (ft)	1974 SWL (ft)	Date	SWL (ft)	Date	1975 SWL (ft)	Date	SWL (ft)	Date
10K1	1650	15.93	4/30	17.89	11/18	16.97	4/14	23.05	10/28
10K2	1650	9.37	4/30	-----	-----	9.89	4/14	15.13	10/28
10L1	1650	13.05	4/30	7.80	11/18	12.89	4/14	19.27	10/28
11K1	1640	Flow	4/30	Flow	11/18	Flow	4/15	Flow	10/27
12B1	1760	36.26	4/29	45.15	11/18	34.35	4/14	62.07	10/27
12C1	1750	62.83	4/30	67.40	11/18	62.90	4/14	68.14	10/27
12F1	1700	35.88	5/01	-----	-----	35.44	4/14	36.24	10/27
12R1	1680	10.96	4/29	12.68	11/18	24.27	4/16	17.64	10/27
13C1	1685	56.25	4/30	58.10	11/20	54.46	4/14	66.93	10/27
13K1	1645	3.72	4/29	13.86	11/18	2.80	4/14	12.00	10/27
13K2	1645	15.79	4/29	18.53	11/18	14.79	4/14	24.46	10/27
13K3	1650	16.80	4/29	21.66	11/18	19.31	4/14	24.58	10/27
14Q1	1635	79.84	4/29	86.39	11/20	79.64	4/14	79.75	10/27
14R1	1630	65.08	4/30	78.20	11/19	57.85	4/14	79.43	10/27
15H1	1620	25.10	4/30	25.37	11/21	-----	4/16	25.77	10/29
15J1	1610	46.94	4/30	47.98	11/19	45.44	4/14	47.39	10/27
16F1 Zone A	1595	11.83	5/02	15.77	11/20	14.15	4/15	15.60	10/14
16F1 Zone B	1595	11.89	5/02	15.74	11/20	14.10	4/15	15.55	10/14
16F1 Zone C	1595	12.44	5/02	16.39	11/20	14.77	4/15	16.15	10/14
16F1 Zone D	1595	207.58	5/02	207.04	11/20	204.40	4/15	203.00	10/14
21D1	1600	36.92	5/01	44.62	11/20	39.95	4/15	36.23	10/29

Well Location	Elevation (ft)	1974 SWL (ft)	Date	SWL (ft)	Date	1975 SWL (ft)	Date	SWL (ft)	Date
21E2	1575	91.52	5/01	96.59	11/20	117.30	4/15	103.38	10/29
21F1	1600	72.36	5/01	79.12	11/20	66.33	4/15	74.03	10/29
21K1	1525	32.13	5/01	38.86	11/20	35.18	4/15	39.18	10/29
22Q1	1460	13.84	4/29	19.53	11/20	13.50	4/15	-----	-----
23E1	1620	63.25	4/29	-----	-----	103.17[1]	4/15	-----	-----
23E2	1610	113.66	4/29	139.75	11/20	120.45	4/16	113.35	10/29
26A2	1480	Flow	4/30	Flow	11/20	Flow	4/16	Flow	10/29
26B1	1510	49.82	4/30	80.92	11/19	54.48	4/14	62.35	10/29
26H1	1580	7.05	4/30	22.84	11/19	10.02	4/14	11.49	10/29
26R1	1650	4.56	4/30	11.28	11/19	3.28	4/14	-----	-----
26R2	1660	21.83	4/30	35.22	11/19	29.50	4/14	43.13	10/29
26R3	1660	21.46	4/30	36.49	11/19	20.34	4/14	44.84	10/29
28P1	1640	93.60	5/02	95.50	11/19	91.30	4/15	93.79	10/28
32R1	1810	147.02	4/30	158.53	11/19	145.56	4/15	144.65	10/27
35H1	1700	14.34	4/30	23.25	11/18	24.90	4/14	29.83	10/29
			R. 4 N.	R. 16 E.					
1K1	1870	25.62	4/30	-----	-----	26.52	4/15	27.89	10/28
1L1	1840	15.37	5/01	18.73	11/20	16.66	4/15	18.83	10/28
6H1	1820	177.35	5/01	180.14	11/21	162.80	4/15	169.75	10/29
10A2	1740	104.09	5/02	Flow[1]	11/20	Flow	4/15	Flow	10/28
10B1	1710	2.54	5/02	5.50	11/20	2.65	4/15	5.18	10/28

Well Location	Elevation (ft)	1974 SWL (ft)	1974 Date	1974 SWL (ft)	1974 Date	1975 SWL (ft)	1975 Date	1975 SWL (ft)	1975 Date
10B2	1730	Flow	5/02	Flow	11/20	Flow	4/14	Flow	10/28
10B3	1800	1.49	5/02	5.15	11/20	3.80	4/15	-----	-----
10B4	1760	-----	----	-----	-----	Flow	4/14	Flow	10/28
10F1	1720	+0.91	5/02	Flow	11/20	Flow	4/15	Flow	10/28
10N1	1670	11.00	5/02	13.14	11/20	12.43	4/15	15.19	10/28
14G1	1790	23.68	5/01	38.15	11/18	40.25	4/15	43.35	10/28
14L1	1760	6.44	5/01	15.30	11/19	6.72	4/15	18.40	10/28
14N1	1840	125.75	5/01	131.58	11/19	129.92	4/15	143.95	10/28
15E1	1680	1.49	5/01	6.40	11/20	2.88	4/14	5.39	10/28
15N1	1680	0.00	5/01	3.03	11/20	Flow	4/14	1.96	10/28
17G1	1620	46.20	5/01	-----	-----	36.00	4/14	45.73	10/29
17N1	1630	11.91	5/01	98.00	11/20	18.50	4/14	77.90	10/28
18A1	1660	33.27	5/02	35.73	11/18	30.07	4/14	-----	-----
19R1	1600	1.25	4/29	3.28	11/20	Flow	4/14	2.05	10/29
19R2	1600	Flow	4/30	-----	-----	Flow	4/14	-----	-----
20F1	1560	16.93	4/29	19.79	11/20	16.50	4/14	25.27	10/25
20G1	1610	3.47	4/30	6.30	11/20	3.46	4/14	7.20	10/28
20M1	1560	0.75	4/29	-----	-----	Flow	4/14	Flow	10/30
21Q1	1690	25.91	5/02	37.98	11/19	32.10	4/14	36.80	10/30
21Q2	1690	25.30	5/02	54.85	11/19	26.00	4/14	51.40	10/30
22L1	1760	49.50	5/01	110.65	11/19	49.30	4/15	76.41	10/29

Well Location	Elevation (ft)	1974 SWL (ft)	Date	SWL (ft)	Date	1975 SWL (ft)	Date	SWL (ft)	Date
22L2	1760	Flow	5/01	Flow	11/19	1.00	4/15	Flow	10/29
22Q1	1760	52.65	5/01	66.59	11/20	54.35	4/15	61.42	10/29
23A1	1855	21.62	5/02	21.64	11/20	20.92	4/15	21.60	10/28
26C1	1830	35.65	5/01	65.90	11/19	37.87	4/15	63.03	10/28
26C2	1830	34.60	5/01	36.53	11/19	34.30	4/15	36.26	10/28
26C3	1830	40.35	5/01	41.05	11/19	39.39	4/15	40.61	10/28
27D1	1755	98.85	5/01	177.05	11/20	97.95	4/15	187.38	10/30
27D2	1755	75.10	5/01	153.10	11/20	74.20	4/15	166.16	10/30
28A1	1715	51.53	5/01	75.45	11/19	50.95	4/14	79.04	10/29
28B1	1710	51.89[2]	5/01	60.40[2]	11/19	52.33[2]	4/14	21.68	10/29
28E1	1700	61.33	5/02	68.58	11/19	61.07	4/14	67.56	10/29
28H1	1740	178.95	5/01	196.85	11/19	176.76	4/14	203.52	10/30
28N1	1730	40.10	5/01	102.80	11/19	101.20	4/16	104.37	10/29
29B2	1640	20.90	4/30	28.85	10/21	21.40	4/15	28.00	10/28
29G1	1660	32.92	4/30	42.00	10/21	33.05	4/15	41.40	10/28
29G2	1660	28.11	4/30	35.78	11/21	28.15	4/15	36.63	10/28
29G3	1660	21.50	4/30	41.83	10/21	19.25	4/15	41.75	10/29
29H1	1700	65.65	4/30	77.20	11/21	62.10	4/15	77.35	10/28
29H2	1700	68.89	4/30	77.47	10/21	68.95	4/15	77.12	10/28
29J1	1720	89.80	4/30	95.85	11/21	89.60	4/15	56.45	10/28
29R3	1710	24.80	4/29	-----	-----	-----	----	-----	-----
30A1	1600	91.78	4/30	-----	-----	-----	----	-----	-----

Well Location	Elevation (ft)	1974 SWL (ft)	Date	SWL (ft)	Date	1975 SWL (ft)	Date	SWL (ft)	Date
30F1	1560	Flow	4/29	Flow	11/20	Flow	4/15	Flow	10/29
31Q1	1650	23.47	4/30	32.86	11/20	119.10[1]	4/14	117.67	10/29
32A1	1715	29.82	4/30	31.72	11/19	29.80	4/14	33.55	10/28
33D1	1730	64.22	5/02	44.00	11/21	42.63	4/16	-----	-----
33D2	1730	44.56	5/02	46.42	11/21	44.70	4/16	48.47	10/28
33G1	1790	78.58	5/01	80.83	11/19	79.40	4/16	80.20	10/28
34H1	1840	52.80	5/01	61.75	11/19	52.99	1/16	53.79	10/29
36R1	1870	10.90	4/29	12.27	11/20	8.00	4/16	12.04	10/28
			T. 4 N.	R. 17 E.					
4E1	2220	+0.26	4/30	+0.25	11/20	+1.05	4/15	+0.04	10/27
9P1	2220	59.42	4/30	66.15	11/20	-----	----	61.50	10/27
18G1	2120	82.47	4/30	84.90	11/18	92.80	4/15	99.17	10/27
18R1	2080	1.38	4/30	1.60	11/18	1.39	4/15	+1.88	10/27
19F1	2040	64.34	5/01	80.22	11/18	68.20	4/16	90.06	10/25
19G1	2020	46.96	5/01	64.15	11/18	55.35	4/16	79.47	10/28
29E1	1980	26.59	5/01	59.72	11/20	58.05	4/15	-----	-----
29P1	1960	71.02	5/02	84.70	11/20	70.44	4/15	91.85	10/28
30A1	2010	66.06	5/01	63.39	11/18	62.36	4/15	63.72	10/28
30D1	1960	3.55	5/01	6.17	11/18	1.05	4/15	6.86	10/28
30J1	1960	21.70	5/02	25.29	11/20	23.10	4/15	24.85	10/28
31L1	1880	27.97	4/30	29.13	11/18	27.79	4/16	26.18	10/28

Well Location	Elevation (ft)	1974 SWL (ft)	Date	SWL (ft)	Date	1975 SWL (ft)	Date	SWL (ft)	Date
31M1	1865	2.20	4/30	6.26	11/18	2.40	4/16	14.02	10/28
31R1	1905	9.65	5/01	20.00	11/18	8.29	4/16	22.41	10/28
32P1	1920	36.50	4/29	48.05	11/18	34.37	4/16	-----	-----
T. 5 N. R. 14 E.									
16L1	1920	Flow	5/01	Flow	11/19	-----	----	Flow	10/29
21A1	1870	213.83	5/01	-----	-----	215.00	----	228.40	10/29
22R1	1740	73.30	5/01	72.45	11/19	70.94	4/14	75.36	10/29
24J1	1980	136.70	5/01	140.23	11/18	137.05	4/15	137.70	10/30
24J2	1990	135.66	5/01	139.76	11/19	-----	----	138.10	10/30
26K1	1700	27.20	5/01	26.50	11/19	-----	----	-----	-----
26K2	1700	53.73	5/01	56.45	11/19	53.23	4/14	-----	-----
36R1	1600	49.75	5/01	116.10	11/19	182.48	4/15	113.30	10/28
T. 5 N. R. 15 E.									
19L1	2040	53.54	5/01	67.69	11/18	53.50	4/15	66.79	10/29
19P1	2000	97.30	5/01	127.64	11/19	97.27	4/15	127.40	10/30
19P2	1990	97.60	5/01	-----	-----	-----	----	-----	-----
19Q2	2050	115.20	5/01	127.19	11/19	115.40	4/15	127.55	10/29
19R1	2055	109.90	5/01	118.17	11/19	109.02	4/15	117.86	10/29
20L1	2040	104.55	5/01	105.09	11/19	-----	----	105.18	10/29
20M1	2100	146.98	5/01	163.75	11/19	151.30	4/16	165.03	10/29

Well Location	Elevation (ft)	1974 SWL (ft)	1974 Date	1974 SWL (ft)	1974 Date	1975 SWL (ft)	1975 Date	1975 SWL (ft)	1975 Date
22J1	2250	148.30	5/02	144.65	11/18	-----	----	-----	-----
23D1	2335	346.90	4/30	289.31	11/18	306.60	4/16	305.77	10/30
25L2	2160	435.95	4/30	435.45	11/18	-----	----	-----	-----
27G1	2050	92.55	4/30	92.29	11/18	92.20	4/16	-----	-----
30J1	1880	35.06	5/02	39.09	11/18	35.48	4/15	38.85	10/29
32P1	1700	28.73	5/02	50.74	11/18	42.83	4/15	56.74	10/29
32Q1	1720	66.84	5/01	65.78	11/20	63.90	4/15	70.72	10/29
34D1	1920	110.26	4/30	110.60	11/18	110.50	4/16	110.52	10/29
T. 5 N. R. 16 E.									
25Q1	2120	126.73	5/01	130.28	11/20	141.80	4/16	>230.00[2]	10/27
30E1	2170	151.60	4/30	-----	-----	-----	----	-----	-----
31E1	2060	226.70	5/01	-----	-----	-----	----	-----	-----
31K1	1940	108.15	4/30	-----	-----	-----	----	-----	-----
34R1	2020	236.44	4/30	141.45	11/20	-----	----	-----	-----
T. 5 N. R. 17 E.									
3N1	2500	30.87	4/29	34.01	11/20	30.37	4/15	35.87	10/29
32D1	2000	35.49	4/30	43.53	11/20	36.63	4/15	45.96	10/27

[1]indicates deepened well

[2]indicates pumping level

APPENDIX F

Surface-Water Quality Analyses from Selected Streams, Klickitat County, Washington.

TABLE F-1. Selected Chemical Analyses, Klickitat River near Pitt, Washington

Date	Mean Discharge	Temperature °C	Conductivity at 25°C	pH	Dissolved Oxygen (mg/l)	Dissolved Solids (mg/l)	Total Nitrate (mg/l)	Total Coliform per 100 ml
1910								
Feb. 5	2859	---	---	---	---	103	0.71	---
Feb. 15	2193	---	---	---	---	97	0.43	---
Feb. 25	4509	---	---	---	---	92	TR	---
Mar. 7	6591	---	---	---	---	87	TR	---
Mar. 14	6428	---	---	---	---	90	TR	---
Mar. 27	4424	---	---	---	---	78	---	---
Apr. 7	3330	---	---	---	---	80	---	---
Apr. 16	3578	---	---	---	---	86	0.10	---
Apr. 26	3961	---	---	---	---	68	0.10	---
May 7	3542	---	---	---	---	54	0.10	---
May 14	3094	---	---	---	---	70	TR	---
May 26	2771	---	---	---	---	67	0.0	---
June 5	2230	---	---	---	---	75	TR	---
June 15	1943	---	---	---	---	63	---	---
June 25	1586	---	---	---	---	93	0.0	---
July 5	1454	---	---	---	---	76	0.0	---
July 15	1368	---	---	---	---	75	---	---
July 25	1167	---	---	---	---	72	---	---
Aug. 4	1090	---	---	---	---	69	---	---
Aug. 14	1025	---	---	---	---	71	0.05	---
Aug. 24	945	---	---	---	---	75	0.45	---
Sep. 3	887	---	---	---	---	73	0.0	---
Sep. 13	849	---	---	---	---	85	0.13	---
Sep. 23	892	---	---	---	---	77	0.05	---
Oct. 3	1097	---	---	---	---	76	0.70	---
Oct. 13	980	---	---	---	---	83	0.35	---
Oct. 23	980	---	---	---	---	76	0.05	---
Nov. 2	868	---	---	---	---	84	0.36	---
Nov. 13	1368	---	---	---	---	68	0.80	---
Nov. 22	1628	---	---	---	---	72	0.20	---
Dec. 2	1711	---	---	---	---	81	TR	---

Date	Mean Discharge	Temperature °C	Conductivity at 25°C	pH	Dissolved Oxygen (mg/l)	Dissolved Solids (mg/l)	Total Nitrate (mg/l)	Total Coliform per 100 ml
1910 (continued)								
Dec. 12	1585	---	---	---	---	83	TR	---
Dec. 22	1301	---	---	---	---	81	TR	---
1911								
Jan. 2	1185	---	---	---	---	80	TR	---
Jan. 11	1045	---	---	---	---	80	TR	---
Jan. 22	1463	---	---	---	---	86	TR	---
Jan. 29	1218	---	---	---	---	85	TR	---
1958								
Oct. 2	746	---	81	7.6	---	67	0.0	---
Oct. 31	737	---	81	7.3	---	67	0.0	---
Dec. 1	1160	---	67	7.3	---	66	0.3	---
Dec. 31	1640	---	66	7.4	---	64	0.4	---
1959								
Jan. 13	4610	---	61	7.1	---	75	1.1	---
Feb. 27	1800	---	80	7.4	---	85	0.9	---
Mar. 31	2410	---	72	7.3	---	68	0.4	---
Apr. 30	2590	---	58	7.4	---	56	0.6	---
June 2	2140	---	55	7.1	---	50	0.3	---
June 30	1390	---	63	7.4	---	55	0.0	---
July 31	900	---	74	7.1	---	69	0.3	---
Aug. 28	750	---	77	7.5	---	77	0.2	---
Sep. 30	935	---	75	7.4	---	68	0.5	---
1966								
Oct. 26	726	---	83	7.2	11.7	75	0.6	36
Nov. 18	844	---	82	7.3	13.4	82	0.2	930
Dec. 29	1210	---	78	7.5	---	71	0.9	---
1967								
Jan. 25	1390	---	79	7.5	---	70	0.4	---

Date	Mean Discharge	Temperature °C	Conductivity at 25°C	pH	Dissolved Oxygen (mg/l)	Dissolved Solids (mg/l)	Total Nitrate (mg/l)	Total Coliform per 100 ml
1967 (continued)								
Feb. 25	1310	---	76	7.7	12.4	68	0.2	930
Mar. 30	1400	---	76	7.8	12.2	66	0.1	36
Apr. 30	1180	---	78	7.5	11.9	73	0.2	0
May 26	2700	---	52	7.4	11.8	49	0.3	430
June 17	2760	---	46	7.3	11.4	44	0.1	230
July 21	1020	---	68	7.8	9.2	62	0.0	---
Aug. 18	804	---	72	7.7	13.4	70	0.4	0
Sep. 21	698	---	78	7.6	10.8	74	0.1	36
Oct. 19	740	10	79	7.5	12.4	71	0.2	---
Nov. 17	1040	6	69	7.8	12.1	62	0.3	---
1968								
Jan. 11	963	4	73	7.6	12.9	65	0.2	---
Feb. 5	3620	4	64	7.3	12.7	68	0.6	---
Mar. 21	1780	5	67	7.6	13.0	62	0.1	---
Apr. 25	1180	7	72	7.5	13.6	67	0.2	202
May 14	1550	8	62	7.2	11.7	60	0.0	160
June 11	1480	14	62	7.3	11.4	54	0.2	440
July 10	936	16	68	7.5	10.1	61	0.1	310
Aug. 12	719	17	77	7.7	10.0	71	0.1	1000
Sep. 17	796	8	79	7.4	10.4	70	0.0	1800
Oct. 21	876	9	80	7.5	11.8	73	0.0	1500
Nov. 13	1860	4.5	54	7.3	11.8	54	0.3	430
Dec. 11	1720	4.7	72	7.2	10.5	70	0.6	3400
1969								
Jan. 22	1380	0.0	78	7.6	11.4	75	0.6	690
Feb. 17	1440	5.1	93	7.6	12.4	75	0.9	3300
Mar. 11	1730	5.5	93	7.7	14.2	88	2.4	80
Apr. 15	3250	8.3	67	7.5	12.0	66	0.9	250
May 20	4180	13.5	49	6.3	10.8	69	0.0	210
June 24	1830	14.0	60	7.7	10.1	57	0.2	640
July 22	1000	20.1	71	7.4	9.4	61	0.1	760

Date	Mean Discharge	Temperature °C	Conductivity at 25°C	pH	Dissolved Oxygen (mg/l)	Dissolved Solids (mg/l)	Total Nitrate (mg/l)	Total Coliform per 100 ml
1969 (continued)								
Aug. 19	814	17.5	76	7.9	9.8	76	0.0	650
Sep. 24	898	11.2	76	7.5	10.8	70	0.1	1300
Oct. 21	780	9.1	82	7.6	12.0	71	0.1	100
Nov. 18	740	6.6	80	7.8	12.5	72	0.1	130
Dec. 16	868	3.2	82	6.8	12.5	68	0.4	340
1970								
Jan. 20	3210	3.1	72	7.2	12.5	60	2.7	1420
Feb. 17	5320	6.0	69	7.5	12.4	74	1.2	1150
Mar. 17	3060	7.2	68	7.3	12.8	62	0.3	205
Apr. 14	1940	7.9	72	7.4	12.9	68	0.1	80
May 19	2880	11.0	54	7.1	11.7	53	0.3	170
June 16	1800	13.1	56	7.4	11.2	53	0.1	200
July 29	918	13.5	75	7.5	10.8	63	0.1	64
Aug. 18	804	15.2	79	7.4	11.1	68	0.0	220
Sep. 14	748	10.3	81	7.8	11.6	72	0.4	140
1971								
Nov. 9	860	5.6	81	7.6	12.1	--	0.017	10
Nov. 23	820	3.9	90	7.1	13.5	--	0.05	---
Dec. 14	1120	3.9	85	---	12.4	--	0.14	18
Dec. 28	990	1.9	--	7.3	13.9	--	0.43	10
1972								
Jan. 12	1020	3.7	--	7.4	12.4	--	0.54	600
Jan. 25	3650	2.3	76	7.6	13.4	--	0.43	170
Feb. 23	4550	4.1	77	7.5	12.6	--	0.22	---
Mar. 1	6000	3.4	--	---	---	--	0.16	700
Mar. 15	6140	6.8	--	7.7	12.1	--	0.11	1500
Mar. 28	3110	5.5	68	7.6	12.4	--	0.18	64
Apr. 12	2410	6.5	--	7.1	12.0	--	0.05	280
Apr. 25	1870	9.0	70	7.9	12.8	--	0.01	---
May 9	2700	9.0	60	7.4	12.2	--	0.06	6
May 24	1870	7.5	46	7.2	11.6	--	0.08	---

Date	Mean Discharge	Temperature °C	Conductivity at 25°C	pH	Dissolved Oxygen (mg/l)	Dissolved Solids (mg/l)	Total Nitrate (mg/l)	Total Coliform per 100 ml
1972 (continued)								
June 14	3000	11.1	48	6.3	10.4	--	0.05	260
June 27	2270	---	53	---	11.0	--	0.03	---
July 12	1870	11.8	57	6.9	10.9	--	0.06	220
July 24	1550	---	--	---	---	--	---	---
July 25	1500	12.0	63	7.7	10.6	--	0.04	---
Aug. 9	1330	14.8	66	7.4	9.7	--	0.06	---
Aug. 22	1060	13.0	98	7.3	10.0	--	0.03	110
Sep. 20	920	9.5	75	7.5	11.2	--	0.07	---
Sep. 27	1020	6.5	80	7.4	12.2	--	0.10	---
Oct. 4	950	8.5	69	7.8	11.4	--	0.01	2000
Oct. 11	920	10.5	77	8.0	11.3	--	0.05	---
Oct. 17	875	6.6	71	7.6	11.5	--	0.03	350
Oct. 24	830	7.0	83	7.5	12.7	--	0.02	---
Oct. 31		3.7	94	7.5	12.7	--	0.02	230
Nov. 8	1020	6.4	79	7.1	12.3	--	0.05	---
Nov. 14	930	6.2	83	7.6	12.4	--	0.03	100
Nov. 28	1030	5.1	64	7.5	12.7	--	0.06	270
Dec. 20	1720	2.6	58	7.2	13.1	--	0.15	800
Dec. 27	2280	5.8	66	7.5	12.4	--	0.23	1200
1973								
Jan. 9	1060	1.1	82	7.1	14.6	--	0.13	140
Jan. 23	1830	2.4	76	7.5	13.6	--	0.23	300
Feb. 6	1240	3.8	84	7.2	13.5	--	0.19	100
Feb. 21	1080	5.0	92	7.4	13.8	--	0.11	700
Mar. 6	1450	5.8	80	7.7	12.7	--	0.04	100
Mar. 20	1280	6.5	49	7.7	12.7	--	0.04	78
Apr. 3	1100	6.7	76	7.5	12.9	--	0.04	800
Apr. 17	1480	8.5	75	8.0	12.0	--	0.03	450
May 8	1360	10.1	260	7.4	11.7	--	0.05	400
May 15	1520	14.0	68	7.7	10.8	--	0.02	350
June 6	1160	15.8	73	7.7	10.8	--	0.02	---
June 19	940	14.5	81	7.9	10.8	--	0.02	---
July 11	848	15.5	83	8.1	10.5	--	0.01	---

Date	Mean Discharge	Temperature °C	Conductivity at 25°C	pH	Dissolved Oxygen (mg/l)	Dissolved Solids (mg/l)	Total Nitrate (mg/l)	Total Coliform per 100 ml
1973 (continued)								
July 24	758	17.4	86	8.2	10.8	--	0.01	---
Aug. 14	740	18.4	88	8.1	9.5	--	0.0	---
Aug. 28	638	14.6	180	7.9	10.0	--	0.02	---
Sep. 11	700	16.4	85	8.1	10.0	--	0.01	---
Sep. 25	785	11.8	91	7.9	11.2	--	0.01	---
1974								
Oct. 8	960	8.4	79	7.6	---	--	---	---
Nov. 13	970	7.1	82	8.0	---	--	---	---
Dec. 9	979	5.6	79	8.0	---	--	---	---
1975								
Jan. 14	3450	4.0	76	7.0	---	--	---	---
Feb. 24	2420	6.6	91	7.4	---	--	---	---
Mar. 18	4000	5.2	72	7.8	---	--	---	---
Apr. 28	2190	8.5	71	8.1	---	--	---	---
May 27	2660	11.4	48	7.7	---	--	---	---
June 25	2490	11.4	51	7.4	---	--	---	---
July 21	1390	17.6	62	7.8	---	--	---	---
Aug. 27	1060	14.4	65	7.6	---	--	---	---
Sep. 17	968	13.1	71	7.9	---	--	---	---

TABLE F-2. Selected Chemical Analyses, White Salmon River near Underwood, Washington

Date	Mean Discharge	Temperature °C	Conductivity at 25°C	pH	Dissolved Oxygen (mg/l)	Dissolved Solids (mg/l)	Total Nitrate (mg/l)	Total Coliform per 100 ml
1960								
Aug. 1	796	---	69	7.7	----	65	0.0	---
Aug. 31	672	---	69	7.5	----	70	0.2	---
Sep. 30	600	---	70	7.6	----	65	0.2	---
Oct. 31	600	---	68	7.3	----	69	0.3	---
Dec. 2	1100	---	58	7.5	----	55	0.2	---
1961								
Jan. 3	850	---	64	7.5	----	61	0.2	---
Feb. 1	2160	---	49	7.3	----	52	0.2	---
Feb. 28	2220	---	54	7.3	----	51	0.2	---
Mar. 31	1970	---	56	7.5	----	49	0.2	---
May 1	1940	---	51	7.4	----	48	0.1	---
June 1	1550	---	52	7.4	----	53	0.1	---
June 30	1070	---	63	7.4	----	64	0.1	---
July 31	867	---	66	7.4	----	62	0.1	---
Aug. 30	710	---	65	7.3	----	70	0.8	---
Oct. 2	647	---	68	7.5	----	66	0.1	---
Nov. 1	658	---	68	7.4	----	64	0.2	---
1962								
Jan. 23	917	---	62	7.3	----	65	0.1	---
May 23	1230	---	56	7.3	----	55	0.0	---
Aug. 31	610	---	70	7.4	----	67	0.1	---
Dec. 4	1480	---	55	7.3	----	58	0.1	---
1963								
Mar. 13	1050	---	58	7.2	----	57	0.2	---
June 5	986	---	59	7.2	----	61	0.2	---

Date	Mean Discharge	Temperature °C	Conductivity at 25°C	pH	Dissolved Oxygen (mg/l)	Dissolved Solids (mg/l)	Total Nitrate (mg/l)	Total Coliform per 100 ml
1963 (continued)								
Sep. 16	570	---	69	7.2	----	75	0.3	---
Dec. 11	746	---	60	7.0	----	60	0.3	---
1964								
Mar. 11	1280	---	62	7.2	----	61	0.2	---
June 11	1550	---	48	7.3	----	47	0.2	---
Oct. 14	658	---	69	7.4	----	67	0.2	---
Dec. 14	958	---	56	7.7	----	57	0.0	---
1965								
Apr. 5	1260	---	60	7.2	----	60	0.2	---
July 7	947	---	65	7.2	----	43	0.2	---
Nov. 30	610	---	68	7.1	----	64	0.4	---
1966								
Feb. 17	735	---	69	7.3	----	64	0.2	---
May 13	1750	---	50	7.2	----	47	0.0	---
Aug. 8	716	---	62	7.5	----	61	0.3	---
Dec. 29	921	---	60	7.4	----	57	0.3	---
1967								
Jan. 25	1410	---	60	7.5	12.2	61	0.2	0
Feb. 25	1290	---	61	7.5	11.9	66	0.1	36
Mar. 30	1280	---	60	7.5	11.6	56	0.2	91
Apr. 20	1040	---	62	7.3	12.3	59	0.1	210
May 26	1360	---	49	7.3	11.2	47	0.1	430
July 21	763	---	65	7.7	10.4	67	0.1	---
Sep. 21	573	---	70	7.3	11.5	64	0.1	36
Oct. 19	660	8	68	7.5	11.6	66	0.1	---
Nov. 17	813	7	59	7.4	11.6	60	0.1	---

Date	Mean Discharge	Temperature °C	Conductivity at 25°C	pH	Dissolved Oxygen (mg/l)	Dissolved Solids (mg/l)	Total Nitrate (mg/l)	Total Coliform per 100 ml
1968								
Jan. 11	878	4	59	7.4	12.2	56	0.2	---
Feb. 5	3180	4	46	7.3	13.5	44	0.4	---
Mar. 21	1520	7	57	7.3	13.3	59	0.1	---
Apr. 25	1120	8	58	7.4	13.3	53	0.2	82
May 14	1150	8	55	7.1	13.2	57	0.0	180
June 12	930	8	58	7.3	12.6	58	0.0	160
July 10	720	10	65	7.6	11.8	58	0.1	170
Aug. 12	574	10	67	7.6	12.4	63	0.2	370
Sep. 18	720	6	66	7.7	11.9	64	0.0	120
Oct. 21	800	8	56	7.6	12.0	59	0.1	100
Nov. 12	2220	6.2	41	7.0	12.0	45	0.2	470
Dec. 11	1540	4.8	53	7.3	11.0	51	0.1	1300
1969								
Jan. 22	1140	3.0	59	7.4	10.8	58	0.0	96
Feb. 17	1140	6.9	63	7.4	12.7	62	0.1	220
Mar. 11	1070	7.0	64	7.6	13.0	63	0.1	28
Apr. 15	1610	8.8	56	7.0	12.5	53	0.3	90
May 20	2490	10.5	40	7.1	11.6	43	0.0	176
June 24	1310	9.7	59	7.6	11.5	56	0.1	65
July 22	959	11.0	66	7.0	11.5	63	0.2	750
Aug. 19	779	9.8	68	7.4	11.5	63	0.3	140
Sep. 24	788	8.9	66	7.1	11.7	61	0.2	840
Oct. 21	645	8.3	67	7.2	12.0	62	0.1	55
Nov. 18	692	6.4	65	7.8	12.3	62	0.2	65
Dec. 16	893	4.2	60	7.2	12.5	56	0.2	500
1970								
Jan. 20	3280	3.5	41	6.6	13.0	36	0.5	1100
Feb. 17	3150	5.9	55	7.4	13.0	52	0.4	200
Mar. 17	2190	6.7	54	7.5	13.1	50	0.3	50
Apr. 14	1550	7.6	55	7.4	12.6	47	0.2	54

Date	Mean Discharge	Temperature °C	Conductivity at 25°C	pH	Dissolved Oxygen (mg/l)	Dissolved Solids (mg/l)	Total Nitrate (mg/l)	Total Coliform per 100 ml
1970 (continued)								
May 19	1530	10.1	49	7.2	12.2	51	0.2	96
June 16	1220	10.2	57	7.7	12.1	54	0.1	210
July 29	650	9.2	67	7.5	12.3	66	0.2	260
Aug. 18	680	10.5	--	---	12.4	--	---	30
Sep. 14	585	9.4	68	7.7	12.0	66	0.2	200
1971								
Nov. 9	640	6.7	61	7.3	12.0	--	0.068	350
Nov. 23	690	5.6	69	7.1	13.4	--	0.05	52
Dec. 14	1360	5.1	64	---	12.3	--	0.067	156
Dec. 28	808	4.6	--	7.1	13.4	--	0.14	6
1972								
Jan. 12	2720	5.1	--	7.2	12.9	--	0.22	300
Jan. 25	2720	3.4	52	7.5	13.6	--	0.26	20
Feb. 23	532	5.2	55	7.1	12.6	--	0.08	---
Mar. 1	689	3.7	--	---	----	--	0.05	1800
Mar. 15	3720	6.2	--	7.0	13.0	--	0.05	640
Mar. 28	2260	5.8	55	7.6	12.9	--	0.22	2
Apr. 12	2330	6.2	--	6.6	12.8	--	0.08	160
Apr. 25	1850	7.5	56	7.3	12.5	--	0.04	---
May 9	2340	7.0	47	7.1	12.5	--	0.05	10
May 24	2520	6.5	42	6.7	12.5	--	0.05	---
June 14	2000	8.5	52	6.7	11.6	--	0.07	270
June 27	1600	---	52	---	11.0	--	0.07	---
July 12	1350	9.5	59	7.5	12.0	--	0.08	100
July 25	1190	8.5	60	7.3	12.0	--	0.12	---
Aug. 9	1040	9.2	65	7.1	11.4	--	0.10	---
Aug. 22	970	9.5	87	7.2	10.8	--	0.07	---
Sep. 20	893	8.2	67	7.5	12.2	--	0.20	---
Sep. 27	941	7.0	63	7.3	12.6	--	0.15	---

Date	Mean Discharge	Temperature °C	Conductivity at 25°C	pH	Dissolved Oxygen (mg/1)	Dissolved Solids (mg/1)	Total Nitrate (mg/1)	Total Coliform per 100 ml
1972 (continued)								
Oct. 11	941	9.5	73	7.3	11.4	--	0.05	---
Oct. 24	----	7.0	63	7.3	13.0	--	0.05	---
Nov. 8	----	6.8	58	7.2	12.4	--	0.06	---
1973								
Feb. 17	----	----	--	---	----	--	----	---
Nov. 25	----	7.4	--	---	----	--	----	---

TABLE F-3. Surface-Water Quality Analyses from Miscellaneous Collection Locations, Klickitat River Basin, Washington

Date	Temperature °C	pH	Dissolved Solids (mg/l)	Conductivity at 25°C	Total Nitrate (mg/l)	Total Col. Form per 100 ml
		14110000 Klickitat River Near Glenwood				
Jan. 13, 1959		7.2	58	53	0.2	
June 2, 1959		7.0	42	45	0.2	
Aug. 27, 1959		7.5	71	74	0.2	
		14112500 Little Klickitat River Near Wahkaicus				
Jan. 13, 1959		7.3	68	76	2.2	
June 2, 1959		7.2	75	96	0.6	
Aug. 28, 1959		8.2	98	127	0.3	
		14108200 Klickitat River Below Soda Springs Creek near Glenwood				
Nov. 7, 1973	2.1	7.6		64	0.6	3
Feb. 6, 1974	1.2			60	0.8	<1
May 7, 1974	8.2			48	9.1	15
Aug. 7, 1974	11.7			54	0.5	1
		14109000 Big Muddy Creek Near Glenwood				
Nov. 7, 1973	1.8	7.6		62	0.4	<1
Feb. 6, 1974	1.4			61	0.6	<1
May 7, 1974	7.9			46	0.5	<1
Aug. 7, 1974	9.9			46	0.6	<1
		14110480 Trout Creek Near Glenwood				
Dec. 4, 1973	2.9			67	0.2	3
May 8, 1974	7.2			57	0.7	<1

Date	Temperature °C	pH	Dissolved Solids (mg/l)	Conductivity at 25°C	Total Nitrate (mg/l)	Total Col. Form per 100 ml
14110490 Elk Creek Near Glenwood						
Dec. 4, 1973	3.4			83	0.4	1
May 8, 1974	0.1			62	0.3	1
14110720 Outlet Creek Near Glenwood						
Dec. 4, 1973	1.8			49	1.6	3
Feb. 6, 1974	1.1			44	0.2	2
Apr. 9, 1974	7.7			58	1.5	3
June 11, 1974	15.8			54	3.1	110
Aug. 7, 1974	20.0			47	1.6	78
14110800 White Creek Near Glenwood						
Nov. 7, 1973	3.2			139	0.8	<1
May 8, 1974	8.1			55	0.7	4
14111100 Summit Creek Near Glenwood						
Nov. 7, 1973	1.4			78	1.2	10
May 8, 1974	7.6			57	1.4	4
14111500 Klickitat River Below Glenwood						
Nov. 7, 1973	4.8			74	0.7	2
May 8, 1974	7.2			52	4.6	25

APPENDIX G

Ground-Water Quality Analyses, Klickitat County, Washington.

Appendix G contains analyses of water samples collected from springs and wells within Klickitat County. Specific elements and ions include silica (SiO_4), chloride (Cl), hardness ($CaCO_3$ or CaMg), iron (Fe), sulfate (SO_4), calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), bicarbonate (HCO_3), carbonate (CO_3), floride (F), nitrate (NO_3), and manganese (Mn). All results are presented in milligrams per liter. Specific conductance (cond) is presented in micromhos and temperature in °C.

TABLE G-1 Water-Quality Analyses from Selected Wells in Klickitat County, Washington

Well Number	Owner	SiO_4	Cl	$CaCO_3$	Fe	SO_4	Ca	Mg	Na	K
2/13--27B1	L. C. Tidyman	104	20.0	626						
28A1	Akira Ogawa	41	12.0	234						
28J1	Owen Sison	39	8.3	187						
33R1	Spokane, Portland & Seattle Railroad	51	4.0	84	0.04	18.0	20.0	8.3	22	4.5
34E1	C. T. Smith	44	5.4	121						
2/15--77M3	Spokane, Portland & Seattle Railroad	53	22.0	187						
3/11--30F1	Underwood Fruit & Warehouse Company	--	4.8	65	0.0	0.7	16.0	6.1	11	3.0
3/14--14N1	Alvin Randall	47	5.4	108						
24P1	L. D. Haverstick	52	18.0	118						
3/15--4H1	Ray Beyerlin	37	9.3	102						
5L1	Peter Anderson	50	8.3	83						
8R1	Harold Isaacson	44	15.0	87						
12A1	Calvin Linden	57	15.0	114						
14D1	Centerville Grange									
21B1	Lyle Woods	61	2.5	70	0.73	0.0	15.0	8.0	12	1.1
26B1	M. H. Eshelman	59	9.3	159						
32C1	E. T. Morran	59	9.3	83						
3/16--4H1	Bert Beyerlyn	41	5.4	83						
4P1	C. A. Gronewald	51	5.9	100						
5A1	O. L. Hamilton	57	6.4	65						
7E1	Frank Linden	60	10.0	91						
8K1	Frank Linden	64	6.4	81						
18D2	L. J. Eshelman	58	17.0	211						
3/17--20L1	Walter Thompson	46	4.4	71						
29A1	Corps of Engineers	60	6.4	100						
3/21--17F1	West Roosevelt	37	27.4	196	0.68	39.3	45.2	20.2	13.0	2.6
24H1	Gas-Ice Corp.	129	6.4	729	11.0	3.4	120.0	106.0	63.0	10.0

Appendix

HCO_3	CO_3	F	NO_3	PO_4	Cond.	Temperature °C	Date Collected	Depth of Well
					1319	15	3/22/66	280
					450	16	3/22/66	169
					297	8	3/22/66	
137	0	--	0	--	--	16	7/28/30	148
					236	16	3/23/66	260
					493	--	3/22/66	475
107	0	0.2	0	.09	145	17	10/29/59	265
					198	14	10/20/65	112
					256	13	10/19/65	90
					219	13	10/20/65	
					174	13	10/20/65	
					201	13	10/19/65	
					268	12	10/12/65	
						12		110
111	0	0.4	0.8	--	183	12	6/28/60	70
					374	--	10/18/65	
					182	12	10/18/65	175
					227	17	10/05/65	
					212	--	10/18/65	
					139	13	10/05/65	
					222	11	10/12/65	150+
					336	12	10/12/65	150
					386	12	10/04/65	70
					107	--	10/22/65	125
					273	18	10/22/65	769
259	--	0	0.7	0	510	6.7	3/14/63	223
1060	0	0.4	0.3	0.03	1410	--	10/21/64	295

TABLE G-1 (Con't)

Well Number	Owner	SiO_4	Cl	$CaCO_3$	Fe	SO_4	Ca	Mg	Na	K
4/14--19C1	Gas-Ice Corp.	89	3.2	172	2.8	0.0	27.0	25.0	30.0	
4/15--1F1	C. E. Mesecher	44	4.4	77						
2J1	C. J. Butts	41	3.4	67						
2N1	G. E. Clouse	62	8.3	85						
5L1	Ronald Alexander	26	12.0	33						
9F1	Ray Hill	71	9.3	262						
12B1	E. H. Amidons	40	4.4	49						
12R1	Bert Knox	41	7.3	61						
13C1	Harold Hill	27	15.0	91						
13K1	Claude Knight	50	11.0	114						
13K2	Claude Knight	35	5.9	61						
14Q1	Ray Hill	24	5.9	20						
15H1	Griselda Hill	43	7.3	55						
21K1	R. M. Divers	38	4.4	73						
23D1	B. F. Dunn	27	5.4	171						
25A1	Ray Shawl	35	23.0	198						
26A1	R. M. Largent	64	3.4	116						
26R1	S. H. Lester	37	5.9	98						
4/16--2L1	C. G. McLary	89	7.8	--						
2N1	Lewis Walter	75	9.8	333						
3L1	Louise Billy	56	5.4	136						
6H1	R. W. Smith	20	12.0	37						
10B2	M. Firch	43	20.0	175						
11M1	C. M. Barrett	55	6.4	118						
14P1	H. L. Norris	49	5.9	132						
16Q2	Goldendale City	45	0.3	416	0.26	0.0	53.6	68.5	68.5	11.4
		45	0.3	388	0.18	0.2	43.2	55.5	61.0	61.0
17R1	G. J. Timmer	51	8.3	159						
18A1	Amos Bonjour	78	4.9	14						

Appendix

HCO_3	CO_3	F	NO_3	PO_4	Cond.	Temperature °C	Date Collected	Depth of Well
284	0	1.1	0.2	0.02	429	23	10/21/64	200
					126	13	10/08/65	186
					126	13	10/11/65	160
					191	12	10/11/65	60
					364	13	10/13/65	147
					576	13	10/07/65	91
					118	11	10/08/65	105
					204	--	10/07/65	
					308	14	10/07/65	320
					301	12	10/08/65	91
					253	11	10/08/65	
					176	13	10/07/65	128
					92	--	10/07/65	65
					316	13	10/13/65	102
					379	13	10/07/65	80
					382	12	10/04/65	86
					221	11	10/13/65	--
					196	13	10/04/65	40
					763	13	10/14/65	60
					691	--	10/14/65	125
					277	--	10/12/65	319
					109	12	10/09/65	360
					404	12	10/14/65	265
					348	--	10/23/65	245
					335	13	10/05/65	120
--	0.4	<0.02	--	--	--	--	4/16/74	
--	0.4	<0.02	--	--	--	--	4/18/74	880
					330	12	10/13/65	155
					166	12	10/07/65	140

TABLE G-1 (Con't)

Well Number	Owner	SiO_4	Cl	$CaCO_3$	Fe	SO_4	Ca	Mg	Na	K
20A1	Klickitat County	47	6.2	110	0.16	3.8	21.0	14.0	13.0	2.0
20M1	C. L. Storkel	51	8.8	89						
21F1	Klickitat County School Dist. #404	--	8.3	85						
26C1	G. W. Willis	49	7.8	96						
27A1	W. P. Cunningham	52	8.3	81						
29J1	Ted Hornibrook	--	4.9	51						
30F1	Ross Crafton	54	7.3	65						
4/17-- 7D1	L. E. Schroder	56	8.8	120						
18G1	Ronald Roe	55	14.0	249						
19F1	Carl Kloker	55	9.8	75						
32J1	Cecil McDowel	64	30.0	217						
5/12-- 4H1	Agnes Miller	--	1.0	94	0.08	2.0	21.0	10.0	8.5	4.7
4H2	Agnes Miller	--	1.5	23	0.33	1.5	5.1	2.6	3.2	2.0
5/14--21A1	Washington State Department of Game	63	6.8	114						
24J1	Floyd Thompson	41	2.9	75						
5/15--22J1	John Bronkhurst	37	2.9	35						
24L1	Ray Gosney	34	4.4	69						
27G1	L. L. Lightfoot	51	7.8	104						
30J1	A. L. King	39	3.9	57						
33J1	R. E. Hunter	33	3.9	65						
34D1	H. W. Freer	37	4.4	71						
5/16--30E1	Hackett	28	3.9	87						
31E1	L. Case	37	2.9	49						
5/23-- 3A	R. J. Petersen	55	27.0	165	0.0	46.0	46.0	12.0	29.0	4.3
6/12-- 2D1	Francis Bean	--	0.7	22	2.1	1.0	5.2	10.0	2.7	0.8
3M1	L. C. Rolph	--	1.0	30	0.07	2.0	7.6	2.7	3.2	1.6
10M1	BIA Ranger Station	--	0.5	23	0.22	0.3	5.2	2.5	3.6	2.0
11E2	L. D. Lloyd	--	0.8	28	0.11	1.5	7.9	2.1	2.8	2.2

Appendix

HCO_3	CO_3	F	NO_3	PO_4	Cond.	Temperature °C	Date Collected	Depth of Well
145	0	0.3	8.0	0.1	271	13	5/19/60	200
					206	12	10/04/65	88
					191	12	8/30/65	90
					212	14	10/05/65	247
					192	14	10/05/65	46
					134	13	8/30/65	118
					149	12	10/04/65	49
					296	12	10/22/65	380
					484	11	10/23/65	125
					169	--	10/23/65	150
					480	11	10/06/65	78
124	--	0.2	0.19	--	195	12	7/17/74	225
36	--	0.1	0.07	--	68	--	7/17/74	19
					287	12	10/13/65	385
					152	12	10/13/65	182
					64	10	10/09/65	
					145	12	10/13/65	470
					231	--	10/11/65	
					130	11	10/13/65	
					161	12	10/11/65	148
					170	11	10/11/65	162
					187	11	10/09/65	225
					142	13	10/08/65	387
163	--	0.3	10.0	--	464	17	5/05/61	81
32	--	0.0	0.01	--	50	7	7/11/74	131
50	--	0.0	0.09	--	82	11	7/11/74	50
39	--	0.1	0.05	--	62	6.1	7/11/74	300
44	--	0.1	0.04	--	75	10	7/16/74	13

TABLE G-1 (Con't)

Well Number	Owner	SiO_4	Cl	$CaCO_3$	Fe	SO_4	Ca	Mg	Na	K
35H1	Paul Ladiges	--	1.4	47	0.5	1.5	11.0	4.8	4.2	2.0
6/23-- 11Q	G. Smith	57	9.8	47	0.2	2.2	12.0	4.1	55.0	11.0

Appendix

HCO_3	CO_3	F	NO_3	PO_4	Cond.	Temperature °C	Date Collected	Depth of Well
64	--	0.1	0.45	--	110	9	7/18/74	104
195	--	1.0	0.10	--	344	21	4/30/62	670

TABLE G-2. Water Quality Analyses from Selected Springs in Klickitat County.

Name	Spring No.	Date	Fe	Mn	Ca	Mg	Na	K	HCO_3	SO_4	Cl	F	NO_3	CaMg	Cond.
M.A. Leonardo	2/13/-21C1s	7/29/30	0.03	--	22.0	11.0	7.8	2.1	116	8.6	5.0	--	7.0	100	--
	5/11/-15D1s	5/6/74	0.12	0.0	27.0	9.2	5.4	1.3	123	1.3	1.1	0.0	--	110	192
	5/11-16J1s	5/3/74	0.41	0.0	5.6	1.6	3.1	0.6	30	1.3	1.1	0.0	--	21	51
	5/12-8H1s	4/25/74	0.38	0.0	15.0	7.4	6.1	2.1	95	1.4	1.5	0.0	--	68	152
Draper Springs	6/12-7A1s	7/16/74	0.02	0.0	4.2	2.2	2.6	1.9	33	0.1	0.5	0.1	0.08	20	55
Willard Spring	6/12-30A1s	4/4/74	0.12	0.0	3.6	2.5	2.8	1.9	30	0.1	0.5	0.0	2.0	19	55
Conboy Lake National Wild-life Refuge	6/12-32E1s	4/4/74	0.01	0.0	4.5	3.0	3.4	2.5	38	1.1	0.3	0.0	0.17	24	67
Wonder Spring	6/13-3E1s	2/24/74	0.05	0.0	8.9	4.5	4.2	1.1	59	1.1	0.2	0.1	0.05	41	97
	6/13-3Q1s	9/4/74	0.05	0.0	5.8	2.7	3.9	1.8	45	0.6	1.0	0.1	0.13	26	78
Wash. Dept. of Fish & Game	6/13-4H1s	10/10/74	2.20	0.06	110.0	95.0	160.0	16.0	1130	2.6	49.0	0.4	0.49	670	1660
Cascade Spring	6/13-10R1s	12/4/73	--	0.0	5.9	2.9	4.0	2.1	45	1.1	0.7	--	0.11	27	72
		2/6/74	--	--	5.4	3.2	4.0	2.1	45	1.6	1.1	--	0.11	27	76
		5/7/74	--	--	6.1	3.2	3.8	2.1	46	1.3	0.9	--	--	28	79
		9/4/74	0.25	0.0	6.1	2.8	4.9	2.5	47	0.6	1.0	0.1	0.16	27	80
	6/13-10R2s	5/7/74	0.02	0.0	7.9	3.5	3.9	1.4	48	1.1	1.1	0.0	--	34	77
	6/13-10R3s	5/7/74	0.02	0.0	12.0	3.6	4.2	1.3	48	1.1	1.1	0.0	--	45	83
	6/13-15A1s	5/7/74	0.02	0.0	6.3	3.4	3.8	1.3	47	1.1	1.0	0.0	--	30	85

APPENDIX H

Water-Right Claims, Klickitat County, Washington

Appendix H contains listings of all water-right claims for both surface and ground-water in Klickitat County. Claims are listed by township. Range and section and quantities are listed by instantaneous and/or annual amounts. Code for uses is D-domestic, S-stock, I-irrigation, N-industrial, P-public supply.

TABLE H-1 Water-Right Claims on Surface Waters, Klickitat County Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
				T. 3 N., R. 10 E.				
Unn. Stream	1	Gov. Lot 4	12/04/59	Davison, G.E.	0.01		D	Y
Big White Salmon River	14	SW4 NW4	2/26/53	USFWS	30.0		S	Y
				T. 3 N., R. 11 E.				
Unn. Stream	3	SW4	1/30/59	Lionberger, I.D.	0.03		D,S	Y
Columbia River	30	N2 S2	4/07/71	Dickey Farms, Inc.	0.67	156.0	I,N	N
Jewett Creek	30	N2	6/23/73	Eugene, J./Karl, L.E.	0.026		I	N
Jewett Creek	30	NW4 NE4	9/20/57	Dickey, J.	0.60	120.0	I,N	Y
Columbia River	32	Gov. Lot 4	4/07/71	Dickey Farms, Inc.	0.71	93.0	I	Y
				T. 3 N., R. 12 E.				
Chamberlain Lk.	33	Gov. Lot 2	6/26/69	Clark, D.C.	1.43	336.0	I,S,D	Y
				T. 4 N. R. 10 E.				
Hangman Creek	1	Gov. Lot 2	7/31/68	Mt. Adams Orchards Co.	0.2	70.6	D,I,N	N
Gilmer Creek	1	SW4 SW4	7/31/22	May, G.H.	0.5		I	Y
Gilmer Creek	1	SW4 SW4	9/24/43	Strode, B.A.	0.2		I	Y
Peck Creek	2	Gov. Lot 4	5/25/21	McFarland, J.M.	0.3		I,D	Y
Spring Creek	2	NW4 SE4	4/20/44	Harrison, C.R.	0.02		D,I	Y
Peck Creek	2	SW4 NE4	10/26/59	Kyte, A.D.	0.06	9.0	I,D	Y
Peck Creek	2	SE4 NW4	10/26/59	Gross, G.E.	0.03		D	Y
B Z Creek	3		5/08/34	B.Z. Corners Water Co.	0.05		D	Y
McFarland Crk.	11	E2 NW4	8/01/73	Veta Hays	0.01	1.0	D	N
Old Logging Camp Creek	11	N2 SW4	8/29/22	Colburn, C.L.	.05		I,D	Y
Cedar Creek	11	SE4 NW4	5/03/29	May, G.H.	0.1		D,I	Y

TABLE H-1 (Cont'd) Water-Right Claims on Surface Waters, Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
E. Spring Crk.	11	SE4 SW4	8/02/38	McIlroy, M.S.	0.1		D,I	Y
Carstens Creek	12	SW4 NW4	11/19/30	Bieanz, W.A.	0.05		D,I	Y
Carstens Creek	12	SW4 NW4	12/24/32	Wallace, F.D.	0.07		D,I	Y
White Salmon R.	12	SE4 SW4	12/27/66	Yarnell, B.H.	0.8	120.0	I	Y
White Salmon R.	12	NW4 SW4	8/23/68	Moon, L.E.	0.04	5.0	D,I	Y
White Salmon R.	13	SE4 SE4	9/03/30	Jones, F.T.	33.01		I,N	Y
Unn. Stream	13	SE4 SW4	11/20/51	Jones, T.N.	0.33	75.0	D,S,I	Y
White Salmon R.	13	NW4 NE4	6/17/74	Tolbert, J.M.	0.37	49.0	I	N
Buck Creek	16	SE4 SE4	5/18/23	Town of White Salmon	2.0		M	Y
Buck Creek	16	SE4 SE4	2/13/57	Town of White Salmon	2.0	688.0	M	Y
Spring Creek	24	SW4 SE4	11/27/72	Smith, Lane	0.92	182.0	D,S,I	N
White Salmon R.	24	NE4 NE4	8/08/73	Schambron, D.A.	1.5	529.0	D,S,I	N
Unn. Stream	24	NW4 NW4	10/02/67	Mordecai/Jones, F.	0.05	9.0	D,I	N
Spring Creek	25	NE4 SW4	12/11/72	Armstrong, Leighton	0.02	2.0	D	N
White Salmon R.	25	SE4 NE4	3/02/70	Mitchell, L.C.	0.09	12.5	D,I	Y
White Salmon R.	25	SE4 NE4	5/07/74	Locke, William Ralph	0.125	9.0	D,I	N
White Salmon R.	26	SE4 SE4	9/04/74	Frank, Leo B.	0.21	30.0	I,D	N
Buck Creek	27	NW4 SE4	5/18/23	White Salmon Irrigation District	4.5		I	Y
Buck Creek	27	SE4	1/20/60	White Salmon Irrigation District	2.0	472.0	M,I	Y
Cathy Creek	36	SE4 NW4	6/14/54	Moon, H.L.	0.48	72.0	I,S	Y
Unn. Stream	36	SE4 SE4	7/13/55	Fordyce Spring, INC.	0.23		D	Y
White Salmon R.	36	NW4 NE4	2/14/68	Talbert, H.W.	0.01	2.0	D	Y
White Salmon R.	36	NE4 NE4	11/05/69	Costanzo, F.	0.9	166.0	I	Y
White Salmon R.	36	NE4	7/01/74	Hopper, William J.	0.46	49.0	D,I	N
				T. 4 N., R. 11 E.				
Unn. Stream	1	NE4 SW4	11/25/64	Rink, R.	0.0075	1.0	D	Y
Unn. Stream (Whiskey Crk.)	5	SE4 NW4	8/02/68	Ehl, Kathreen	0.07	7.0	D,P	Y

TABLE H-1 (Cont'd) Water-Right Claims on Surface Waters, Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
Gilmer Creek	6	Gov. Lot 2	7/16/68	Mr. Adams Orchards	0.1	58.1	D,I,N	N
Unn. Stream	5	Gov. Lot 4	8/02/68	Ehl, Kathreen	0.1	10.0	I	N
Weberg Creek	35	NE4 SW4	4/29/52	Venden, J.O.	0.03		I,D	Y
Weberg Creek	35	NW4 SE4	5/31/74	Peiper, J.A.	0.015	2.0	D	N
Unn. Stream	36	SW4 SE4	12/19/29	McCormick, A.C.	0.1		N,D	Y
				T. 5 N., R. 11 E.				
Gilmer Creek	31	SW4 SE4	5/31/67	Mt. Adams Orchards Co.	0.745	80.0	I	Y
				T. 5 N., R. 12 E.				
Hurd Creek	30	NE4 SW4	3/12/25	Independent Box Co.	0.0166	0.125	D	Y
				T. 6 N., R. 10 E.				
Trout Lake Crk.	22	NE4 NE4	7/01/74	Pearson, Monte	5.0		D,S,I	N
Trout Lake Crk.	22	NE4 NE4	7/01/74	Pearson, Monte	6.0		D,S,I	N
Cave Creek	27	NE4	8/22/73	Ordway, R.C.	0.02	7.6	D,S,I	N
Cave Creek	27	SE4	9/03/75	Chambers, Donald H.	0.02	2.0	D	N
Cave Creek	28	SE4	8/22/68	Jennings, R.L.	0.3	30.0	I	Y
				T. 6 N., R. 11 E.				
Unn. Stream	20	SW4 SE4	11/08/48	Halse/Fisher	0.03		D,S	Y
Unn. Stream	29	SE4 SW4	6/27/74	Williams, Larry	1.5	283.0	I	N
White Salmon R.	31	SE4 SE4	1/26/76	Clausen, V.H.	0.02		D,I	N
				T. 2 N., R. 13 E.				
Spearfish Lake	25	SW4 NW4	11/13/64	Eddins Brothers	1.0	200.0	I	Y

TABLE H-1 (Cont'd) Water-Right Claims on Surface Waters, Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
Bonneville Pool	28	Gov. Lot 2	10/17/30	N. Dalles Irrigation District	5.0		D,I	Y
Bonneville Pool	28	Gov. Lot 2	6/26/62	N. Dalles Irrigation District	0.67	240.0	I	Y
				T. 2 N., R. 14 E.				
Eight Mile Crk.	8	NW4 NW4	6/12/52	Reuter, J.A.	0.54		D,S,I	Y
				T. 2 N., R. 15 E.				
Celilo Lake	12	NE4 SW4	12/18/67	Jaekel, L.B.	2.0	325.0	I	Y
				T. 2 N., R. 16 E.				
Columbia River	4	Gov. Lot 5	2/20/70	Washington State Parks Com.	0.5	72.0	I	N
				T. 3 N., R. 12 E.				
Unn. Stream	3	Gov. Lot 4	7/27/67	Tuthill, P.E.	1.0	240.0	I	N
Unn. Stream	3	NW4 SW4	3/24/70	Rosenbaum	0.01	1.0	D	N
Unn. Stream	9	SW4 NE4	5/01/57	Mattox, P.E.	0.09	12.0	I,D	Y
Silvas Creek	10	SW4 SE4	8/22/55	Bolter/Landgraf	0.03		N	Y
Silvas Creek	15	NE4 NE4	3/16/65	Pimley, R.	0.02	4.0	D	Y
Klickitat River	25	NE4	6/25/74	Frey, Spencer	1.4	231.0	I	N
Klickitat River	26	SE4	6/12/47	Washington State Dept. Fisheries	250.0		S	Y
				T. 3 N., R. 13 E.				
Unn. Stream	2	SE4 NE4	6/07/73	Cameron, Hugh		0.6	S	N

TABLE H-1 (Cont'd) Water-Right Claims on Surface Waters, Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
Unn. Stream	7	SE4 SW4	5/05/37	Chilcote, G.H.	0.06		D,N	Y
Rattlesnake Crk	10	SE4 NE4	3/20/73	Markgraf, Frank D.	0.88	166.0	I	N
Unn. Stream	11	SW4	4/14/75	Fromer, Martin B.	0.3	100.0	I	N
Unn. Stream	15	NE4 SW4	5/13/47	Hendryx, R.	0.40		D,I	Y
White Salmon R.	19	Gov. Lot 4	11/27/72	Smith, Lane	0.02	2.0	D,S	N
White Salmon R.	19	Gov. Lot 4	7/30/65	Mansfield, R.J.	0.25	51.0	I	Y
Unn. Stream	19	NW4 NE4	11/24/71	Smith, Charles D.	0.25	54.0	I,S	N
White Salmon R.	19	Gov. Lot 3	7/25/66	Glacier Orchards	1.0	300.0	I	N
Unn. Stream	21	SW4 SW4	10/14/68	Bondurant, J.C.	0.04	5.0	D,S,I	Y
White Salmon R.	30	Gov. Lot 2	11/30/71	Anderson, F.J.	1.50	367.0	S,I	N
White Salmon R.	30	Gov. Lot 2	8/15/72	Duhrkop, Lester N.	1.0	75.4	I	N
White Salmon R.	30	Gov. Lot 2	12/03/73	Duhrkop, Lester N.	2.0	26.0	I	N
West Major Crk.	35	NW4 SW4	5/09/63	Ogilvie, F.	0.01	2.0	D,S	Y
West Major Crk.	35	SW4 NW4	11/05/64	Fritchey, T.	0.2	40.0	I	Y

T. 4 N., R. 12 E.

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
Unn. Stream	31	SE4 SE4	12/11/64	Graves, S.		9.5	S	Y
Unn. Stream	31	SE4 SE4	10/20/60	Graves, S.	0.2		S	Y

T. 5 N., R. 10 E.

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
Unn. Stream	1	NE4 SW4	5/28/64	Maxwell, S.H.	0.0075		D,S	Y
Klickitat River	5	SE4 NW4	2/08/73	Bartholomew, Basil	0.01	1.4	I	N
Klickitat River	5	SE4 NW4	9/07/67	Miller, H.E.	0.09	18.0	D,I	Y
Klickitat River	5	SE4 NW4	9/18/67	Wark, D.E.	0.01	2.0	D	Y
Klickitat River	8	NE4 SW4	8/22/73	Whittum, Donald J.	0.05	18.0	I,D	N
Klickitat River	8	SE4 NW4	4/30/74	Patterson, Fred	0.02	4.0	I	N
Unn. Stream	10	SE4 SE4	9/15/54	Marx, P.		1.75	S	Y
Klickitat River	19	SE4 NW4	4/11/69	Pimley, S.	0.2	32.0	I	Y

TABLE H-1 (Cont'd). Water-Right Claims on Surface Waters, Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
				T. 3 N., R. 16 E.				
Unn. Stream	36	Gov. Lot 3	3/18/29	Warren, C.	0.1		I,D	Y
				T. 4 N., R. 12 E.				
Unn. Stream	11	SE4 NW4	9/24/56	Case, R.W.	0.01	1.0	S	Y
Unn. Stream	28	NE4	4/11/75	Lewis, Bruce H.	0.22		D,I	N
				T. 4 N., R. 13 E.				
Skookum Canyon Creek	2	SW4 NW4	8/04/70	Woodruff, J.M.	2.0	333.0	I	N
Klickitat River	23	SE4 NW4	8/30/73	St. Regis Paper Co.	2.0	941.0	P,N	N
Klickitat River	27	NE4 NW4	4/01/69	Meyer, T.A.	0.81	131.0	I,S	Y
Klickitat River	28	SE4	8/22/73	Hart, Howard M.	0.04	7.0	I	N
Klickitat River	28	SE4 NE4	2/20/74	Kessinger, Billie J.	0.05	8.3	I	N
Klickitat River	28	NE4 SE4	11/24/69	Cowell, T.E.	0.04	6.7	I	Y
Klickitat River	28	SE4	5/28/74	Hart, Howard M.	0.2	13.0	I	N
Klickitat River	32	NE4 SW4	6/23/72	Hathaway, Everett	0.5	100.0	I	N
				T. 4 N., R. 14 E.				
Unn. Stream	1	SE4 NW4	8/01/74	Sipe, Kenneth D.		6.0	S	N
Bowman Creek	2	Gov. Lot 2	1/05/50	McEwen, C.F.	0.2	60.0	I	Y
Klickitat River	9	SE4 NW4	3/18/64	Morgan, H.	0.16	32.0	I	Y
Klickitat River	17	NE4 SW4	7/15/57	Emerson, W.F.	0.1	24.0	I	Y
Klickitat River	17	SW4 NE4	12/02/68	Lauerman, L.H.	0.02	2.0	I	Y
Klickitat River	18	SE4 SE4	8/19/71	Morehead, Irvin J.	0.12	17.0	I	N
Klickitat River	18	SE4 SE4	5/22/73	Anderson, Edwin R.	0.01	2.0	D	N
Klickitat River	19	Gov. Lot 1	8/16/71	Robinson, Harry E.	0.36	51.4	I	N
Unn. Stream	21	NE4	2/14/74	Van Belle, Leroy		3.0	S	N

TABLE H-1 (Cont'd) Water-Right Claims on Surface Waters, Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
				T. 4 N., R. 15 E.				
Unn. Stream	2	SW4	00/00/1897	Spalding, Daryl C.	0.01	0.03	S	N
Blockhouse Crk.	3	SW4 SE4	00/00/1878	Knox, Bert H.	0.34	58.14	I	N
Blockhouse Crk.	3	SW4 SE4	00/00/1897	Steele, Joseph F.	0.01	0.01	S	N
Blockhouse Crk.	3	NW4 SE4	00/00/1887	Schroder/Winterstein	0.42	71.82	I	N
Blockhouse Crk.	3	NW4 SE4	00/00/1887	Schroder/Winterstein	0.02	1.0	D	N
Blockhouse Crk.	3	NW4 SE4	00/00/1878	Wishram Land Co.	0.11	18.81	I	N
Unn. Stream	3		00/00/1897	Wishram Land Co.	0.1	17.1	I	N
Mill Creek	4	NW4 NW4	10/29/47	Calvert, O.L.	0.75	270.0	I	Y
Unn. Stream	5	NE4 NW4	1/27/50	Thompson, C.G.	0.01		D,I	Y
Mill Creek	5	SE4 NE4	7/21/75	Thiele, Dale	2.0		I	N
Mill Creek	7	NE4 NE4	8/18/75	Harris, James M.	2.0		I	N
Unn. Stream	9	SW4 SE4	1/08/70	Boardman, Robert W.	0.2	2.0	D,S	N
Blockhouse Crk.	9	SE4 SW4	9/29/64	Gillenwaters, D.	0.05		N,D	N
Blockhouse Crk.	9	SW4 SE4	00/00/1897	Woodward, John T.	0.01	0.01	S	N
Blockhouse Crk.	9	SE4 SE4	00/00/1897	Gillenwaters, D.	0.01	0.01	S	N
Blockhouse Crk.	9	NE4 SE4	00/00/1897	Woodward, K.	0.01	0.01	S	N
Blockhouse Crk.	9	NE4 SE4	00/00/05	Woodward, K.	0.02	3.42	I	N
Blockhouse Crk.	9	NE4 SE4	00/00/05	Woodward, K.	0.74	126.54	I	N
Blockhouse Crk.	9	SE4 NE4	00/00/1897	Ihrig, Robert	0.01	0.01	S	N
Blockhouse Crk.	9	SE4 NE4	00/00/21	Ihrig, Jason	1.2	205.2	I	N
Blockhouse Crk.	9	S2 SE4	00/00/1897	Bellamy, Paul L.	0.01	0.02	S	N
Blockhouse Crk.	9	SW4 SE4	00/00/1897	Woodward/Hatfield	0.01	0.02	S	N
Blockhouse Crk.	10	N2	7/17/73	Hutton, Robert F.	1.0		D,S,I	N
Blockhouse Crk.	10	NE4 SE4	00/00/04	Ihrig, Jason	0.15	25.65	I	N
Blockhouse Crk.	10	NW4 NW4	00/00/1899	Beebe, George	1.02	174.4	I	N
Blockhouse Crk.	10	SE4 NE4	00/00/12	Beebe, George	0.02	0.17	D,S	N
Blockhouse Crk.	10	NE4 NW4	00/00/1880	Hutton, Robert F.	0.02	3.42	I	N
Blockhouse Crk.	10	NW4 NE4	00/00/1897	Hutton, Robert F.	0.01	0.05	S	N
Blockhouse Crk.	10	SE4 SE4	00/00/1897	Imrie, Robert	0.01	0.09	S	N

TABLE H-1 (Cont'd) Water-Right Claims on Surface Waters, Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
Spring Creek	11	NW4 SE4	7/29/38	Washington State Dept. Game	10.0		S	Y
Unn. Stream	11	SE4 SW4	10/04/48	Campbell, C.H.	0.01		D	Y
Spring Creek	11	SE4 SW4	10/04/48	Campbell, C.H.	0.15		I	Y
Blockhouse Crk.	11	NW4	00/00/1897	LeFever, Charles H.	0.01	0.09	S	N
Spring Creek	14	NW4 SW4	6/26/72	Hill, Raymond C.	2.0		I	N
Spring Creek	15	SW4 SW4	6/10/44	Beddoe/Starr	3.0		I	Y
Spring Creek	15	NE4 SW4	7/24/46	Butler, G.W.	1.6		I	Y
Spring Creek	15	SE4	9/10/47	Morris, A.L.	1.0		I	Y
Spring Creek	15	SE4 SW4	7/09/48	Tupper, C.L.	0.13	30.0	I,D	Y
Spring Creek	15	SE4	3/11/76	Rose, Gordon A.	2.0		I	N
Blockhouse Crk.	16	NE4 NW4	8/29/41	Bowen, B.T.	0.20		D,I	Y
Blockhouse Crk.	16	SE4 NW4	6/10/44	Beddoe/Starr	2.0		I	Y
Blockhouse Crk.	16	NE4	00/00/1897	Washington St. Dept. Natural Resources	0.01	0.04	S	N
Blockhouse Crk.	16	NW4	00/00/1897	Washington St. Dept. Natural Resources	0.01	0.06	S	N
Blockhouse Crk.	16	NW4 NE4	00/00/01	Woodward, John T.	0.08	13.68	I	N
Blockhouse Crk.	16	NE4 NW4	00/00/1897	McGrew, Richard C.	0.01	0.01	S	N
Blockhouse Crk.	16	NE4 NW4	00/00/09	McGrew, Richard C.	0.5	85.5	I	N
Blockhouse Crk.	16	SE4 NW4	6/10/44	Tupper, C.L.	3.04	519.84	I	N
Blockhouse Crk.	16	NE4 NW4	00/00/14	Bellamy, Paul L.	0.02	3.42	I	N
Blockhouse Crk.	17	SW4	00/00/1897	Hornibrook, R.E.	0.01	0.18	S	N
Blockhouse Crk.	17	NE4 SE4	00/00/1897	Bellamy, Paul L.	0.01	0.09	S	N
Blockhouse Crk.	18	SE4	00/00/1897	Cunliffe,R.G.	0.01	0.09	S	N
Blockhouse Crk.	19	SE4	00/00/1897	Tupper, C.L.	0.01	0.25	S	N
Unn. Stream	23	SW4 NW4	5/18/64	Dunn, B.F.	2.0	600.0	I	Y

T. 4 N., R. 16 E.

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
Bloodgood Crk.	8	SE4 SW4	4/12/26	Elliott, J.	0.5		I	Y

TABLE H-1 (Cont'd) Water-Right Claims on Surface Waters, Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
Bloodgood Crk.	8	SE4 SW4	9/27/39	Pascoe, W.W.	0.2		I	Y
Bloodgood Crk.	8	SE4 NW4	4/06/49	Olson, V.L.	0.08		I	Y
Little Klickitat River	10	NE4 SW4	6/26/74	Koenig, Charles A.	0.02	2.0	D	N
Bloodgood Crk.	17	SE4	7/01/22	Smith, J.D.	0.1		D,S,I	Y
Unn. Stream	17	NW4 SE4	4/14/65	Powell, G.	0.01	2.0	D	Y
				T. 5 N., R. 11 E.				
Unn. Stream	23	SE4 SE4	11/21/25	Standard Lumber Co.	0.5		N	Y
				T. 5 N., R. 15 E.				
Devils Canyon Creek	1	SW4 NW4	4/06/76	Seward, Melvin	2.0	10.0	I	N
Devils Canyon Creek	3	SE4 SE4	5/21/46	Lewis, C.M.	0.3		I	Y
Mill Creek	10	SW4 NE4	1/02/73	Ray, James W.	0.02		D	N
Devils Canyon Creek	10	NW4 SW4	5/23/46	Bronkhorst, J.	0.3		I	Y
Unn. Stream	10	NW4 SW4	5/23/46	Bronkhorst, J.	0.2		I	Y
No Name Creek	10	SE4	4/28/76	Davis, Jeffrey W.	0.0077		D	N
Devils Canyon Creek	14	SW4 SW4	6/30/55	Popenoe, J.W.	0.3	80.0	I	Y
Unn. Stream	24	NW4 NE4	2/23/76	Lane, Larry	0.01		D	N
Pothole Lake	25	NW4 SE4	3/03/69	Case, Lloyd	1.0	100.0	I	N
Unn. Stream	31	SE4	8/22/63	Schilling, P.		9.9	S,I	Y
Smith-Warren Creek	32	SW4 SW4	7/15/75	Keech, Henry H.	0.5		I	N
Mill Creek	33	NE4 NE4	1/25/50	Freer, H.W.	0.5		I	Y

TABLE H-1 (Cont'd) Water-Right Claims on Surface Waters, Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity Instantaneous (CFS)	Quantity Annual (Acre feet)	Use	Certification
				T. 5 N., R. 16 E.				
Unn. Stream	23	NE4 SW4	7/20/60	Tyler, G.	0.02		D,S	Y
Cozy Nook Creek	23	NE4 SW4	1/20/72	Tyler, G.	0.111		D,S	N
Cozy Nook Creek	26	NW4 SE4	8/23/71	San Refugio Ranch		120.0	I	N
Cozy Nook Creek	26	SE4 NW4	4/23/68	San Refugio Ranch	1.0	48.2	I	Y
Cozy Nook Creek	26	SE4 NW4	8/23/71	Van Aelst, Neil	1.0	111.8	I	N
Unn. Stream	34	SE4 SE4	9/25/64	Van Aelst, Neil		12.2	I	Y
				T. 5 N., R. 17 E.				
Little Klickitat River	3	SW4 NE4	8/26/66	Washington State Parks Com.	0.025	5.0	D	Y
Dry Creek	4	SE4 NE4	2/02/61	Saal, C.F.	0.6	90.0	I	Y
				T. 6 N., R. 12 E.				
Frazier Creek	3	NE4 SW4	00/00/01	Chandler, O.E.	0.5		D,S,I	N
Bird Creek	10	NE4 NW4	00/00/1882	Goodman, J.	1.06		D,S,I	N
Frazier Creek	3	SE4 NW4	00/00/01	Ladiges, H.	1.0		D,S,I	N
Frazier Creek	3	NE4 SW4	00/00/1888	Schultz, C.	0.5		D,S,I	N
Bird Creek	3	SW4 SW4	00/00/1890	Collman, O.C.	0.49		D,S,I	N
Bird Creek	3	NW4 NW4	00/00/02	Schultz, G.	1.25		D,S,I	N
Frazier Creek	3	NW4 NW4	00/00/1888	Schultz, G.	0.5		D,S,I	N
Frazier Creek	10	NE4 SE4	00/00/1889	Bleiler, O.D.	0.12		D,S	N
Frazier Creek	10	NE4 SE4	00/00/1889	Borde, W.	0.012		D,S,I	N
Bird Creek	15	NE4 NW4	00/00/18	Bunnell, A.L.	0.88		D,S,I	N
Bird Creek	10	NE4 SW4	00/00/1879	Conboy, P.	0.004		D,S,I	N
Bird Creek	10	NE4 SW4	00/00/1879	Conboy, P.	0.006		D,S,I	N
Bird Creek	10	NE4 SW4	00/00/1879	Creighton, F.	0.006		D,S,I	N
Bird Creek	10	NE4 SW4	00/00/1879	Dean, M.A.	0.004		D,S,I	N

TABLE H-1 (Cont'd) Water-Right Claims on Surface Waters, Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
Bird Creek	10	NW4 SE4	00/00/1889	Devoe, H.	0.5		D,S,I	N
Bird Creek	10	NW4 SE4	00/00/1879	Gilmore, M.P.	0.006		D,S,I	N
Frazier Creek	10	NE4 SE4	00/00/1889	Gilmore, M.P.	1.25		D,S,I	N
Bird Creek	10	NE4 NW4	00/00/1882	Goodman, J.	0.5		D,S,I	N
Frazier Creek	10	SW4 NE4	00/00/1879	Hansen, H.	0.006		D,S,I	N
Frazier Creek	10	NE4 SE4	00/00/1885	Hanson, J.H.	0.75		D,S,I	N
Frazier Creek	10	NE4 SE4	00/00/1900	Hanson, J.H.	0.94		D,S,I	N
Bird Creek	10	NE4 SW4	00/00/1889	Hilding, A.	1.0		D,S,I	N
Bird Creek	10	NE4 SW4	00/00/1898	Hilding, A.	0.5		D,S,I	N
Bird Creek	10	NE4 SW4	00/00/1879	Hoult, O.	0.003		D,S,I	N
Bird Creek	10	NW4 SE4	00/00/1879	Jaekel, A.O.	0.003		D,S,I	N
Frazier Creek	10	SW4 NE4	00/00/1879	Jebe, W.F.	0.1		D,S,I	N
Frazier Creek	10	NE4 SE4	00/00/1889	Keel, J.	0.1		D,S,I	N
Bird Creek	10	NE4 SW4	00/00/1879	Kuhnhausen, H.	0.009		D,S,I	N
Frazier Creek	14	NE4 SW4	00/00/1884	Kuhnhausen, H.	2.0		D,S,I	N
Bird Creek	10	NE4 SW4	00/00/1879	Kuhnhausen, M.	0.009		D,S,I	N
Frazier Creek	10	SW4 NE4	00/00/1879	Huffsmith, E.P.	0.05		D,S,I	N
Frazier Creek	10	NE4 SE4	00/00/1911	Huffsmith, E.P.	0.75		D,S,I	N
Bird Creek	10	NE4 SW4	00/00/1879	Shaw, E.	0.003		D,S,I	N
Bird Creek	10	NW4 SE4	00/00/1879	Troh, H.F.	0.003		D,S,I	N
Frazier Creek	10	NE4 SE4	00/00/1889	Wright, W.	0.25		D,S,I	N
Bird Creek	10	NW4 SE4	00/00/1879	Prahl, S.	0.006		D,S,I	N
Bird Creek	10	NW4 SE4	00/00/1879	Prahl, J.S.	0.009		D,S,I	N
Bird Creek	10	SW4 NE4	00/00/1879	Gump, A.J.	0.95		D,S,I	N
Bird Creek	10	SE4 NW4	00/00/1882	Gump, A.J.	1.0		D,S,I	N
Bird Creek	10	SE4 SW4	00/00/1916	Gump, A.J.	0.19		D,S,I	N
Bird Creek	10	NW4 SE4	00/00/1879	Prahl, J.	0.003		D,S,I	N
Frazier Creek	10	NE4 SE4	00/00/1889	Murray, C.E.	1.75		D,S,I	N
Frazier Creek	10	NE4 SE4	00/00/1889	McEwen, H.W.	0.025		D,S,I	N
Frazier Creek	14	NE4 NW4	00/00/1884	Leaton, W.	1.9		D,S,I	N
Frazier Creek	11	SW4 SW4	11/30/37	Yates, R.E.	1.5		I	Y

TABLE H-1 (Cont'd) Water-Right Claims on Surface Waters, Klickitat County, Washington

Source	Sec-tion	Location	Priority	Name	Quantity Instan-taneous (CFS)	Quantity Annual (Acre feet)	Use	Certifi-cation
Frazier Creek	14	NW4 NW4	8/22/22	Ladiges, M.	2.0		I	Y
Frazier Creek	14	NW4 NW4	00/00/1912	Bertschi, A.	1.0		D,S,I	N
Frazier Creek	14	SW4 NE4	00/00/1911	Hanson, A.G.	0.75		D,S,I	N
Frazier Creek	14	NW4 NW4	00/00/1882	Hoult, P.	2.0		D,S,I	N
Frazier Creek	14	NW4 SE4	00/00/1918	Kuhnhausen, H.	1.0		D,S,I	N
Frazier Creek	14	SE4 NW4	00/00/1881	Lindbaugh, M.L.	0.81		D,S,I	N
Frazier Creek	23	NE4 NW4	00/00/1918	Lindbaugh, M.L.	1.62		D,S,I	N
Frazier Creek	14	SW4 NE4	00/00/1911	Oneal, J.K.	0.5		D,S,I	N
Frazier Creek	14	SE4 NW4	00/00/1901	Troh, P.J.	1.0		D,S,I	N
Bird Creek	15	NW4	03/17/20	Trout, C.L.	0.5		D,I	Y
Bird Creek	15	SE4 NW4	00/00/1885	Bartholomew, E.E.	1.0		D,S,I	N
Bird Creek	15	NE4 NW4	00/00/1898	Bertschi, A.	0.5		D,S,I	N
Bird Creek	15	NE4 NW4	00/00/1898	Bertschi, A.	0.5		D,S,I	N
Bird Creek	15		00/00/1898	Hilding, A.	0.5		D,S,I	N
Bird Creek	15	NE4 NW4	00/00/1880	Livingston, B.	2.0		D,S,I	N
Bird Creek	15	NE4 NW4	00/00/1909	Feller, C.	0.5		D,S,I	N
Bird Creek	15	NE4 NW4	00/00/1909	Feller, F.	0.62		D,S,I	N
Bird Creek	15	NE4 NW4	00/00/1909	Feller, R.V.	0.38		D,S,I	N
Bird Creek	16	NE4 NE4	03/17/20	Kincher, H.	0.5		D,I	Y
Bird Creek	16	NE4 SE4	00/00/1885	Bartholomew, E.E.	1.0		D,S,I	N
Bird Creek	16	SE4 NE4	00/00/1885	Bolt, W.T.	1.0		D,S,I	N
Bird Creek	16	NE4 SE4	00/00/1904	Borde/Hanson	0.25		D,S,I	N
Bird Creek	16	NE4 SE4	00/00/1885	Columbia State Bank	0.92		D,S,I	N
Bird Creek	16	NE4 SE4	00/00/1885	Columbia State Bank	1.0		D,S,I	N
Bird Creek	16	NE4 SE4	00/00/1903	Hall, E.	0.5		D,S,I	N
Bird Creek	16	NE4 SE4	00/00/1888	Howe, J.	1.75		D,S,I	N
Bird Creek	16	SE4 NE4	00/00/1885	Kuhnhausen, A.	1.5		D,S,I	N
Bird Creek	16	SE4 NE4	00/00/1885	Kuhnhausen, A.	0.5		D,S,I	N
Bird Creek	16	NE4 SE4	00/00/1885	Kuhnhausen, E.	0.08		D,S,I	N
Bird Creek	16	NE4 SE4	00/00/1885	Kuhnhausen, E.	2.0		D,S,I	N
Bird Creek	16	NE4 SE4	00/00/1885	Murray, H.R.	0.25		D,S,I	N

TABLE H-1 (Cont'd) Water-Right Claims on Surface Waters, Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
Bird Creek	16	NE4 SE4	00/00/1885	Murray, H.R.	0.5		D,S,I	N
Bird Creek	16	NE4 SE4	00/00/1914	Mytting, E.S.	0.5		D,S,I	N
Bird Creek	16	NE4 SE4	00/00/1885	Richelderfer, H.N.	0.5		D,S,I	N
Bird Creek	16	NE4 SE4	00/00/1885	Kuhnhausen, O.	0.5		D,S,I	N
Bird Creek	16	NE4 SE4	00/00/1897	Kuhnhausen, O.	2.0		D,S,I	N
Bird Creek	16	NE4 SE4	00/00/1885	Kuhnhausen, O.	0.5		D,S,I	N
Bird Creek	20	SE4	7/27/21	Bertschi, V.C.	1.0		D,I	Y
Bird Creek	20		7/27/21	Bertschi, V.C.	1.0		D,I	Y
Bird Creek	21	NW4 SE4	00/00/1885	Cole, J.N.	0.37		D,S,I	N
Bird Creek	21	NE4 NE4	00/00/1885	Kuhnhausen, P.	1.25		D,S,I	N
Bird Creek	21	NE4 NE4	00/00/1885	Kuhnhausen, P.	0.12		D,S,I	N
Bird Creek	21	SE4 SW4	00/00/1888	Markgraff, F.	0.25		D,S,I	N
Bird Creek	21	NE4 NE4	00/00/1885	Grubb, J.H.	0.75		D,S,I	N
Bird Creek	21	SW4 SE4	2/3/39	Hathaway, M.	6.5		I	Y
Frazier Creek	23	NW4 NW4	00/00/1917	Radford, G.C.	0.25		D,S,I	N
Frazier Creek	24	NW4 NW4	00/00/1889	Lindbaugh, M.L.	0.62		D,S,I	N
Bird Creek	28	SE4 NW4	00/00/1913	Kuhnhausen, A.	0.15		D,S,I	N
Bird Creek	28	SE4 NW4	00/00/1886	Kuhnhausen, A.	0.36		D,S,I	N
Bird Creek	28	NE4 NW4	00/00/1886	McGrath, A.	1.38		D,S,I	N
Bird Creek	28	NE4 NW4	00/00/1914	Restorff, C.C.	1.0		D,S,I	N
Bird Creek	28	NE4 SW4	00/00/1913	Smith, P.	0.12		D,S,I	N
Bird Creek	28	NE4 SW4	00/00/1915	Smith, P.	2.0		D,S,I	N
Bird Creek	28	NE4 NW4	00/00/1914	Rugg, S.V.	1.06		D,S,I	N
				T. 6 N., R. 17 E.				
Unn. Sream	26	SW4 SW4	5/10/39	Smart, T.F.	0.05		D,I	Y
Unn. Stream	34	SE4 SW4	10/09/43	Washington State Park & Recreation Com.	0.01		D,I	Y

TABLE H-1 (Cont'd) Water-Right Claims on Surface Waters, Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
				T. 7 N., R. 12 E.				
Bacon Creek	21	SE4 NE4	00/00/04	Mt. Adams Pine Co.	3.94		I	N
Bacon Creek	21	SE4 NE4	00/00/04	Borde, V.	2.62		I	N
Bacon Creek	21	SE4 NE4	00/00/04	Wellenbrock, H.	0.82		I	N
Bacon Creek	21	SE4 NE4	00/00/04	Wellenbrock, R.R.	1.32		I	N
Bacon Creek	21	SE4 NE4	00/00/04	Wellenbrock, G.	0.49		I	N
Bacon Creek	21	SE4 NE4	00/00/04	Schneidler, M.	0.66		I	N
Bacon Creek	21	SE4 NE4	00/00/04	Moles, J.	0.33		I	N
				T. 3 N., R. 17 E.				
Columbia R.	21	Gov. Lot 3	3/19/69	Martin/Marietta	35.03	25416.0	N	N
				T. 3 N., R. 20 E.				
Chapman Creek	7	SE4	8/6/52	White, H.A.	0.25	50.0	I	Y
				T. 3 N., R. 21 E.				
Columbia R.	19	NE4 NE4	8/2/67	Seely, W.C.	10.0	2000.0	I	N
Columbia R.	19	NE4	11/4/74	Pacific Power & Light Co.	270.0		N,I	N
				T. 4 N., R. 17 E.				
Unn. Stream	26	NW4 SW4	11/14/74	Davenport, Jack		3.0	S	N
Unn. Stream	27	NE4 SW4	11/14/74	Davenport, Jack		3.2	S	N

TABLE H-1 (Cont'd) Water-Right Claims on Surface Waters, Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
				T. 4 N., R. 18 E.				
Unn. Stream	8	NW4 SE4	10/23/73	Anderson, E.W.		1.0	S	N
Rock Creek	26	NE4 NE4	05/29/36	Jackson, R.A.	0.4		I	Y
				T. 4 N., R. 19 E.				
Chapman Creek	35	NW4 SE4	05/15/53	Kelley, C.D.	0.01		D,S	Y
				T. 4 N., R. 20 E.				
White Creek	6	SW4	05/24/66	Wilkins, B.		9.0	I	N
White Creek	7	Gov. Lot 1	5/24/66	Wilkins, B.		2.6	I	N
Unn. Stream	7	Gov. Lot 1	10/19/64	Wilkins, D.J.	0.2	60.0	I	N
				T. 4 N., R. 21 E.				
Pine Creek	16	SW4 NW4	10/17/56	Washingtin State Dept. Natural Resources	0.16	32.0	I	Y
Pine Creek	17	SE4 NE4	10/17/56	Whitmore, H.D.	0.08	16.0	I	Y
				T. 5 N., R. 21 E.				
Sixprong Creek	20	NE4 NE4	5/22/68	Whitmore, H.D.	0.01	1.0	S	Y

TABLE H-2 Water-Right Claims on Springs in Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
				T. 3 N., R. 10 E.				
Unn. Spring	2	Gov. Lot 1	7/12/73	Gauvin, L.	0.02	6.6	I	N
Unn. Spring	2	SW4	6/19/28	Read, T.E.	0.05		D,I	Y
Unn. Spring	10	NW4	7/01/74	Mt. Adams Orchard Co.	0.7	196.0	I	N
Unn. Spring	11	NW4 SW4	3/24/65	Connolly, M.J.	0.1	36.0	I	Y
Unn. Spring	12	NW4 NE4	7/12/62	Henderson, C.V.	1.0	200.0	D,I	N
Unn. Spring	14	NE4 NW4	1/17/73	Portner, Charlotte	2.0		D,S,I	N
Unn. Spring	14	SW4 SE4	5/18/73	Aston, W.W.	0.01	4.6	I	N
Unn. Spring	14	SW4 SE4	9/18/73	Connolly, Ersula	0.01	2.0	D,S	N
Unn. Spring	24	Gov. Lot 2	4/20/26	Clark, H.C.	0.25		D,I	Y
				T. 3 N., R. 11 E.				
Unn. Spring	2	NW4 SE4	4/27/62	Kida, G.	0.10	30.0	D,I	Y
Unn. Spring	5	SW4 SW4	9/17/68	Nickols, J.	0.01	2.0	D	Y
Unn. Spring	5	SW4 NW4	12/05/74	Harris, Thomas E.	0.033	6.0	D,I	N
Unn. Spring	6	SW4 SE4	3/13/68	Jones, E.L.	0.02	4.0	D,I	Y
Unn. Spring	7	NW4	9/25/73	Ladiges, C.R.	0.42	68.0	D,I	N
Unn. Spring	7	SE4 SW4	4/09/65	Hawkins, M.D.	0.05	11.0	D,I	Y
Unn. Spring	8	NE4 NW4	8/12/74	Barrett, Thomas L.	0.01	2.0	D	N
Unn. Spring	10	NW4 NW4	5/02/74	Tetreault, Robert B.	0.1		D,S,I	N
Unn. Spring	10	NW4 NW4	5/02/74	Tetreault, Robert B.	0.06		D,S,I	N
Unn. Spring	10	NW4 NW4	5/02/74	Tetreault, Robert B.	0.4		S,I	N
Unn. Spring	19	SE4 NW4	2/27/63	City of White Salmon	1.0	688.0	P	Y
Unn. Spring	23	SW4	7/01/74	Meader, Darrell	0.6	161.0	D,I	N
Unn. Spring	25	SW4 SW4	3/04/68	Lauterbach, W.R.	0.01	3.0	D,S	Y
Unn. Spring	29	SW4 SE4	8/27/71	Powell/Van Vliet	0.04	2.0	D	N
Unn. Spring	30	Gov. Lot 1	10/29/71	Murray, Edwin D.	0.25	28.0	D,I	N
Unn. Spring	30	Gov. Lot 1	6/27/74	Hearn, William R.	0.22	39.0	D,I	N

TABLE H-2 (Cont'd) Water-Right Claims on Springs in Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity Instantaneous (CFS)	Quantity Annual (Acre feet)	Use	Certification
				T. 3 N., R. 12 E.				
Unn. Spring	7	NE4 NW4	8/16/74	Cochenour, S.	0.03	4.0	D,S	N
Unn. Spring	7	E2 NW4	8/16/73	Cochenour, S.	0.02	2.0	I	N
Unn. Spring	21	NW4 NE4	11/13/74	Rowland, James	0.02	2.0	D	N
Unn. Spring	28	SE4 NW4	7/20/73	Gunter, M.E.	0.15	25.3	D,I	N
Unn. Spring	29	SW4	5/14/76	Tuthill, Andy	0.5		D,S,I	N
Unn. Spring	33	NE4 NW4	9/18/68	Dohrman, L.I.	0.025	5.0	D,S,I	Y
				T. 4 N., R. 10 E.				
Unn. Spring	1	NW4 SE4	7/16/68	Mt. Adams Orchards Co.	0.089	44.6	D,I	N
Unn. Spring	1	SE4 SE4	7/16/68	Mt. Adams Orchards Co.	0.1	44.8	D,I	N
Unn. Spring	1	SE4 SE4	7/16/68	Mt. Adams Orchards Co.	0.044	5.6	D	N
Unn. Spring	1	Gov. Lot 2	7/16/68	Mt. Adams Orchards Co.	0.2	70.6	D,I,N	N
Unn. Spring	1	S2 NE4	7/16/68	Mt. Adams Orchards Co.	0.2	84.1	D,I,N	N
Unn. Spring	1	SE4 SW4	7/16/68	Mt. Adams Orchards Co.	0.13	58.1	D,I,N	N
Unn. Spring	1	SE4 SW4	3/04/38	Rayburn, U.W.	0.1		D	Y
Unn. Spring	1	SE4 SW4	6/04/45	Mt. Adams Orchards Co.	0.1		D,N,I	Y
Unn. Spring	1	SW4 NW4	3/11/66	Gross, W.A.	0.01	1.0	D	Y
Unn. Spring	2	Gov. Lot 3	8/18/60	Kelly, C.	0.06	10.0	D,I	Y
Unn. Spring	2	SW4 SE4	7/28/64	Meyers, Lawrence B.	0.03	3.0	D	N
Unn. Spring	11	NW4 SE4	2/23/55	De Lay, A.O.	0.01		D,I	Y
Unn. Spring	11	NW4 SE4	2/23/55	Baugher, E.J.	0.01		I,D	Y
Unn. Spring	11	NW4 SE4	10/14/57	Chapman, T.A.	0.01		D	Y
Unn. Spring	11	NW4 SE4	8/28/59	Johnson, M.L.	0.04		D	Y
Unn. Spring	11	NE4 NE4	9/01/59	Arnett, W.H.	0.03	3.0	D,I	Y
Unn. Spring	11	NE4 NE4	10/27/59	Beasley, O.M.	0.01	3.0	D,I	Y
Unn. Spring	11	NE4 NE4	10/27/59	Beasley, O.M.	0.01	3.0	D,I	Y
Unn. Spring	11	NE4 NE4	10/27/59	Skidmore, J.	0.01	1.5	D,I	Y

TABLE H-2 (Cont'd) Water-Right Claims on Springs in Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity Instantaneous (CFS)	Quantity Annual (Acre feet)	Use	Certification
Unn. Spring	11	NE4 NE4	10/27/59	Gross, H.	0.01	3.0	D,I	Y
Unn. Spring	11	E2 SE4	9/08/69	Drew, H.	0.25		I,D	N
Unn. Spring	12	SW4 NW4	4/29/74	Ensiminger, B.	0.01	2.0	D	N
Unn. Spring	13	NE4 SW4	8/12/70	Gribner, W.O.	0.05	7.5	D,S,I	N
Unn. Spring	13	SE4 SE4	7/01/46	Moore, A.F.	0.01		D	Y
Unn. Spring	13	SW4 NW4	7/11/58	Murphy, A.D.	0.01		D	Y
Unn. Spring	14	SE4 NE4	5/09/49	Gross, A.J.	0.15		I,D	Y
Unn. Spring	14	SE4 NE4	7/06/50	Thompson, W.R.	0.04		D,I	Y
Unn. Spring	14	SE4 NE4	4/19/67	Murphy, L.A.	1.0	2.0	D	Y
Unn. Spring	23	SW4 SE4	6/14/73	Casad, Alice	0.01	1.0	D	N
Unn. Spring	23	SW4 SE4	6/14/72	Casad, Alice	0.01	1.0	D	N
Unn. Spring	23	NW4 SE4	11/17/59	Claridge, A.J.	0.09	24.0	D,I	Y
Unn. Spring	23	NW4 SE4	4/16/75	Taggard, James H.	0.022	2.0	D	N
Unn. Spring	24	SW4 NW4	4/05/74	Olson, Kent C.	0.01	2.0	D	N
Unn. Spring	26	SE4 SW4	9/28/74	Howard, Ricky D.	0.222	30.0	D,I	N
Unn. Spring	36	SW4 SW4	4/25/61	Aplin, S.R.	0.01		D	Y
Unn. Spring	36	NW4 NE4	2/21/68	Schmid, Loren L.	0.01	1.0	D	N
Unn. Spring	36	NW4 SE4	5/14/74	Wall/Meyers	0.02	4.0	D	N
				T. 4 N., R. 11 E.				
Unn. Spring	6	Gov. Lot 7	7/16/68	Mt. Adams Orchards Co.	0.055	5.6	D	N
Susie Springs	17	SE4 SW4	12/29/52	Locke, M.	0.11	40.0	D,I	Y
Unn. Spring	18	Gov. Lot 4	8/23/68	Daubenspeck, W.F.	1.0	200.0	I,D	N
Unn. Spring	30	NW4 SE4	7/01/37	Klickitat School District #54	0.12		D	Y
Unn. Spring	30	Gov. Lot 2	1/06/65	Anderson, F.J.	0.27	82.0	D,I	Y
Unn. Spring	33	W2 NW4	9/06/73	Smith, Virginia	0.08	6.0	I,S	N
Unn. Spring	33	W2 NW4	8/20/65	Fleck, F.G.	0.05	9.0	S,I	N
Unn. Spring	35	NW4 SE4	10/19/55	Fritchey, A.T.	0.01		D	Y
Unn. Spring	35	NE4 SW4	9/11/61	Fritchey, T.	0.2	38.0	D,I	Y

TABLE H-2 (Cont'd) Water-Right Claims on Springs in Klickitat County, Washington

Source	Sec-tion	Location	Priority	Name	Quantity Instan-taneous (CFS)	Quantity Annual (Acre feet)	Use	Certifi-cation
				T. 4 N., R. 12 E.				
Unn. Spring	7	Gov. Lot 4	2/14/73	Hilts, Leon	0.01	2.0	D,S,	N
Unn. Spring	20	NW4	3/04/74	Buist, Niel	0.12	16.0	D,S,I	N
				T. 5 N., R. 10 E.				
Unn. Spring	1	SE4 NW4	9/03/63	Seifert, O.	0.0025	0.5	D	Y
Unn. Spring	1	SE4 NW4	9/03/63	7th Day Adventist Church	0.0025	0.5	D	Y
Unn. Spring	1	E2 NW4	3/09/66	Dodge, D.	0.01	3.0	D,S	Y
Unn. Spring	26	NW4 SW4	9/09/68	Robbins, R.G.	0.03	4.0	D,I	Y
				T. 5 N., R. 11 E.				
Unn. Spring	5	Gov. Lot 3	10/19/72	McCoy/Holliston	0.0025	1.0	D	N
Unn. Spring	5	SW4 NW4	1/10/73	Sweighoefer, Erwin	0.02	2.0	D	N
Unn. Spring	5	NW4 NW4	10/10/74	Genasci, Donald B.	0.25	35.0	D,I	N
Unn. Spring	7	SW4 NE4	9/27/68	Anrig, J.T.	0.02	4.0	D	Y
Unn. Spring	7	SW4 NE4	5/28/74	Chubb, Herbert	0.02		D,S	N
Unn. Spring	7	SW4 NE4	5/28/74	Chubb, Herbert	0.01	3.0	I	N
Unn. Spring	7	NW4 SE4	7/01/74	Chubb, Randall	0.01	4.6	I,D	N
Unn. Spring	31	SE4 SW4	7/16/68	Mt. Adams Orchards Co.	0.011	5.6	D	N
Unn. Spring	31	SW4 NE4	7/16/68	Mt. Adams Orchards Co.	0.044	5.6	D	N
Unn. Spring	31	SE4 NE4	9/06/68	Kreps, O.T.	0.012	3.0	D,S	Y
Unn. Spring	21	SE4 NW4	6/27/74	St. Regis Paper Co.	0.01	1.0	S	N
Log Corral Sprs.	23	NE4 SW4	5/24/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	25	SW4 SW4	8/23/73	St. Regis Paper Co.	0.01	1.0	S	N
Dunkard Springs	26	SE4 NE4	5/24/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	26	NE4 SW4	8/23/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	33	NW4 SE4	4/25/66	Moore, D.D.	0.005	1.0	D	Y

TABLE H-2 (Cont'd) Water-Right Claims on Springs in Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
				T. 6 N., R. 10 E.				
Unn. Spring	3	Gov. Lot 2	5/24/72	Burdett, James	0.75		D,I	N
Unn. Spring	3	SE4 NE4	10/05/73	Glacier Springs Water	1.78	538.0	D	N
Unn. Spring	3	NW4 NE4	6/10/50	Glacier Springs Water	0.3		D,P	Y
Bear Spring	7	NE4 SW4	5/18/36	U.S. Forest Service	0.25		D	Y
Bear Spring	7	SW4 NE4	12/23/36	Dean, W.H.	0.25		I,D,N	Y
Unn. Spring	20	NE4	11/16/73	Clark, David	0.08	8.0	D	N
Unn. Spring	33	NW4 NE4	6/13/72	Madison, John E.	0.01	1.0	D	N
Unn. Spring	35	NE4 SW4	5/16/49	Dietsch, G.A.	0.22		D	Y
Unn. Spring	36	NW4 SW4	10/17/61	Lost Springs, Inc.	0.07		D	Y
Steel Spring	17	NW4 SW4	5/24/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	18	SW4 SE4	8/30/73	St. Regis Paper Co.	0.02	1.0	S	N
Unn. Spring	19	SE4 NE4	8/02/60	Trout Lake Grange	0.022	8.0	I	Y
Unn. Spring	32	SE4 SW4	10/19/72	McCoy/Holliston	0.01	2.0	D	N
Unn. Spring	32	NE4 SE4	1/31/62	Allaway, C.W.	0.10	9.0	I,D,S	Y
				T. 2 N., R. 13 E.				
Unn. Spring	16	SW4 NW4	8/22/69	Beeks, Elmer	0.04	7.0	D,I	N
Unn. Spring	16	SE4 NE4	2/22/41	O'Neal, C.E.	0.14		I	Y
Unn. Spring	16	Gov. Lot 1	3/13/61	Kock, J.	0.2	40.0	I	Y
Unn. Spring	16	SE4 SW4	3/13/61	Kock, J.	0.01		D	Y
Unn. Spring	16	NE4 SW4	12/17/68	McKinnon, G.M.	0.01	2.0	D	Y
Unn. Spring	24	NE4 NW4	8/15/30	McNary, L.A.	0.05		D,I	Y
Unn. Spring	33	Gov. Lot 5	6/09/66	Dallesoprt Development Company	0.3	30.0	D,I	N
				T. 2 N., R. 14 E.				
Unn. Spring	4	SE4 SW4	4/02/58	Clark, B.J.	0.04	4.0	I,D,S	Y

TABLE H-2 (Cont'd) Water-Right Claims on Springs in Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
Unn. Spring	6	NE4 SE4	7/11/18	Brune, L.F.	1.0		S,D,I	Y
Unn. Spring	12	SE4 SW4	9/17/69	Coffield & Sons	0.10	67.0	D,S	N
				T. 2 N., R. 15 E.				
Unn. Spring	7	SW4 NW4	9/17/69	Coffield & Sons	0.25	112.0	D,I	N
				T. 2 N., R. 16 E.				
Unn. Spring	5	NW4 NE4	8/05/74	Gore, Earl	0.05	23.0	S,I	N
				T. 3 N., R. 12 E.				
Unn. Spring	3	SW4 SW4	6/10/70	Dalby, W.	0.005	0.5	D	N
Unn. Spring	4	SW4 NW4	8/26/70	Butler, James	0.08	11.4	I	N
Unn. Spring	9	NE4 SE4	6/03/74	Weaver, Harry	0.35	66.0	I	N
Unn. Spring	10	NW4 SW4	2/06/76	McCarthy, Dennis	0.02		I	N
Unn. Spring	15	SW4 NE4	3/21/74	Keyes, Francis H.		8.0	S	N
Unn. Spring	21	NW4 NE4	11/13/74	Player/Rowland	0.4		S,D,I	N
Unn. Spring	28	NW4 SW4	10/10/68	Clark, D.C.	0.02	3.5	D,S,I	Y
				T. 3 N., R. 13 E.				
Dead Horse Spr.	8	SE4 NW4	10/29/52	Sorenson, E.A.	0.01		D	Y
Dead Horse Spr.	8	SE4 NW4	7/13/65	Kreps, O.P.	0.5		D,I	N
Dead Horse Spr.	8	SE4 NW4	7/19/65	Bellamy, F.O.	0.02		D	N
Unn. Spring	17	NW4 NE4	6/30/74	Bertschi, Jerry	0.05	12.0	D,I	N
Unn. Spring	19	NE4 NW4	9/03/75	Pimley, Steve	0.02	2.0	D	N
Unn. Spring	31	SW4 SE4	8/03/60	Williams, L.L.	0.01	2.0	D	Y

TABLE H-2 (Cont'd) Water-Right Claims on Springs in Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
				T. 3 N., R. 15 E.				
Unn. Spring	4	NW4	6/10/74	Eshelman, C.	0.01	2.0	D,S	N
				T. 3 N., R. 16 E.				
Unn. Spring	33	SW4 NW4	5/29/74	Short, Marshall	0.2		I	N
				T. 4 N., R. 12 E.				
Unn. Spring	10	SE4 SW4	6/07/71	Hinkle, W.H.	0.005	1.0	D	N
				T. 4 N., R. 13 E.				
Unn. Spring	22	NE4 SW4	6/09/58	Stearns, A.E.	0.05		D	Y
Unn. Spring	23	NE4 SE4	3/13/40	Cox, G.L.	0.01		D	Y
Unn. Spring	23	NW4 NE4	1/21/46	Fink & Hoagland	0.02	1.0	D,I	Y
Unn. Spring	23	NE4 NW4	6/25/74	St. Regis Paper Co.	0.015	1.0	D	N
Unn. Spring	28	SW4 NE4	10/18/73	Vogt, K.	0.02	7.0	D,I	N
Unn. Spring	28	NE4 SW4	4/05/56	Mitchell, H.R.	0.01		D,I	Y
Unn. Spring	28	SW4 NE4	5/23/56	Bales, D.	0.02	4.0	D,I	Y
Unn. Spring	28	NE4	6/05/56	Thiebolt, C.F.	0.01		D	Y
Unn. Spring	28	SE4 NW4	1/03/57	Kuhnhausen, O.J.	0.01		D,S	Y
Unn. Spring	28	NE4 SW4	12/11/64	Mitchell, I.	0.005	2.0	D	Y
				T. 4 N., R. 14 E.				
Unn. Spring	17	SW4 NE4	1/27/47	McIntyre, A.	0.01		D	Y
				T. 4 N., R. 15 E.				
Wet Weather Spr.	1	NE4	7/16/75	Thiele, Dale		9.9	I	N

TABLE H-2 (Cont'd) Water-Right Claims on Springs in Klickitat County, Washington

Source	Sec-tion	Location	Priority	Name	Quantity: Instan-taneous (CFS)	Quantity: Annual (Acre feet)	Use	Certifi-cation
Spring Branch	2	NW4 SW4	10/08/48	Williams, F.L.	0.1		I	Y
Unn. Stream	2	Gov. Lot 3 (SW4 SW4)	8/30/63	Spalding, Daryl	0.05		S	N
Unn. Spring	2	NW4 SW4	00/00/30	Shupe, A.	0.02	1.0	D	N
Unn. Spring	2	NW4 SW4	00/00/48	Shupe, A.	0.1	17.1	I	N
Unn. Spring	2	NW4 SW4	00/00/55	Shupe, A.	0.24	41.04	I	N
Unn. Spring	3	SW4 SE4	3/01/48	Knox, B.H.	0.25		D,I	Y
Unn. Spring	3	SW4 SE4	00/00/48	Knox, B.H.	0.02	1.0	D	N
Unn. Spring	3	SE4 SW4	00/00/48	Knox, B.H.	0.21	35.91	I	N
Unn. Spring	3	NW4 SE4	00/00/1878	Steele, Joseph	0.1	17.1	I	N
Unn. Spring	3	SW4 SE4	00/00/48	Steele, Joseph	0.02	1.0	D	N
Unn. Spring	3		00/00/1897	Wishram Land Co.	0.01	0.34	S	N
Unn. Spring	6	SW4 SW4	5/13/60	McEwen, H.W.	0.1	40.0	I	Y
Unn. Spring	9	SE4 SW4	9/29/64	Gillenwaters, D.	0.2		N,D,S	N
Unn. Spring	9	SW4 NE4	00/00/1866	Hill, Raymond	0.02	1.0	D	N
Unn. Spring	9	NW4 SE4	00/00/1897	Hill, Raymond	0.01	0.17	S	N
Unn. Spring	9	NW4 SE4	00/00/07	Hill, Raymond	0.8	136.8	I	N
Unn. Spring	9	NW4 SE4	9/19/47	Hill, Raymond	1.0	171.0	I	N
Unn. Spring	9	NW4 SW4	00/00/1897	Bellamy, Paul	0.01	0.09	S	N
Unn. Spring	9	NW4 SW4	00/00/70	Bellamy, Paul	0.02	1.0	D	N
Unn. Spring	9	NW4 NE4	00/00/32	Woodward/Hatfield	0.02	1.0	D	N
Unn. Spring	11	NE4 NW4	00/00/1897	Adams, Christian	0.01	0.14	S	N
Unn. Spring	24	NW4 NW4	6/26/74	Tobin, Lyle	0.002	1.6	D	N
Unn. Spring	30	NE4 SW4	7/28/69	Richardson, W.R.	0.01	1.0	S	Y
				T. 4 N., R. 16 E.				
Unn. Spring	1	NE4 SE4	5/22/74	Cahill, Robert		8.0	S	N
Bloodgood Sprs.	8	NE4 NW4	8/27/58	City of Goldendale	1.0		P	Y
Bloodgood Sprs.	8	NE4 NW4	9/22/39	City of Goldendale	1.0		P	Y

TABLE H-2 (Cont'd) Water-Right Claims on Springs in Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity Instantaneous (CFS)	Quantity Annual (Acre feet)	Use	Certification
				T. 5 N., R. 11 E.				
Unn. Spring	9	SW4 NE4	7/14/26	O'Connell, T.F.	0.05		I,D	Y
Unn. Spring	24	SW4 SW4	11/21/25	Standard Lumber Co.	0.1		D	Y
				T. 5 N., R. 12 E.				
Unn. Spring	12	SW4 SW4	8/23/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	24	NE4 NW4	8/23/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	25	SW4	8/23/73	St. Regis Paper Co.	0.01	1.0	S	N
				T. 5 N., R. 13 E.				
Kuhnausen Sprs.	5	SW4 NW4	5/24/73	St. Regis Paper Co.	0.01		S	N
Unn. Springs	7	SW4 SE4	8/23/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Springs	7	NE4 SE4	8/23/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	8	NE4 SE4	1/17/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	8	NE4 SW4	1/17/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	11	SE4 SE4	8/23/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	17	SE4 SE4	8/23/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	20	NW4 SE4	1/17/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	23	SW4 NW4	8/23/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	28	SW4 NW4	1/17/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	30	SE4 NW4	1/22/73	St. Regis Paper Co.	0.01	1.0	S	N
				T. 5 N., R. 15 E.				
Unn. Spring	11	NW4 NW4	5/13/46	Lewis, C.M.	0.20		I,D	Y
Unn. Spring	15	SE4 NE4	2/12/70	Hutton, Robert	0.03		D,S,I	N
Unn. Spring	15	SE4 NE4	2/12/74	Hutton, Robert	0.1	25.0	I	N
Unn. Spring	27	NW4	10/31/75	Bronkhorst, J.C.	0.01		D	N

TABLE H-2 (Cont'd) Water-Right Claims on Springs in Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
Unn. Spring	33	SW4 SW4	2/28/51	Anderson, C.	0.03	8.0	D,I	Y
T. 5 N., R. 16 E.								
Unn. Spring	22	SW4 SW4	10/03/69	Sellers, Richard	0.01	1.0	D	N
T. 5 N., R. 17 E.								
Unn. Spring	8	SW4 SE4	3/12/74	Andersen, Henry		0.5	S	N
T. 6 N., R. 11 E.								
Chapman Spring	21	NE4	8/14/73	St. Regis Paper Co.	0.01		S	N
Chapman Spring	21	NE4	8/14/73	St. Regis Paper Co.	0.02		S	N
Unn. Spring	22	NW4 NW4	1/17/73	St. Regis Paper Co.	0.01		S	N
Unn. Spring	27	NW4	8/14/73	St. Regis Paper co.	0.015		S	N
Unn. Spring	27	SW4	8/14/73	St. Regis Paper Co.	0.015		S	N
Unn. Spring	27	SW4	8/14/73	St. Regis Paper Co.	0.015		S	N
Unn. Spring	29	SW4 SE4	1/17/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	32	SE4	11/08/73	Gearin, John	0.01		D	N
T. 6 N., R. 12 E.								
Unn. Spring	4	SE4 NE4	4/26/67	Sheridan, W.B.	0.2	60.0	I	N
Draper Spring	7	NE4 NE4	1/17/73	St. Regis Paper Co.	0.45		D,S	N
Unn. Spring	31	SE4	8/31/64	Kreps, R.R.	1.5	405.0	I	Y
T. 6 N., R. 13 E.								
Wonder Spring	3	SW4 NW4	4/01/53	Washington State Dept. Fisheries	12.0		S	N

TABLE H-2 (Cont'd) Water-Right Claims on Springs in Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
Unn. Spring	4	NE4	12/07/73	Washington State Dept. Fisheries	12.0		S	N
Indian Ford Spr.	4	Gov. Lot 2	6/19/46	Washington State Dept. Fisheries	15.0		S	Y
Indian Ford Spr.	4	Gov. Lot 1	6/19/46	Washington State Dept. Fisheries	2.0		S	N
Junction Spring	16	NE4	8/14/73	St. Regis Paper Co.	0.015		S	N
Wellenbrock Spr.	19	SE4 SE4	5/24/73	St. Regis Paper Co.	0.18		S	N
Cottonwood Spr.	21	SE4 SE4	5/24/73	St. Regis Paper Co.	0.01		S	N
Unn. Spring	21	SW4 SW4	8/23/73	St. Regis Paper Co.	0.01	1.0	S	N
Unn. Spring	36	Gov. Lot 8	1/17/73	St. Regis Paper Co.	0.16	10.0	D	N
				T. 6 N., R. 14 E.				
Sixzeroone Waterhole	17	SW4 NW4	1/11/74	St. Regis Paper Co.	0.01	7.26	S	N
				T. 6 N., R. 15 E.				
Unn. Spring	6	SW4 SE4	1/11/74	St. Regis Paper Co.	0.01	7.26	S	N
Unn. Spring	8	SE4 NW4	1/11/74	St. Regis Paper Co.	0.02	14.52	S	N
				T. 6 N., R. 16 E.				
Rockwell Spr.	22	NW4	9/17/31	City of Goldendale	1.0		P	Y
				T. 6 N., R. 17 E.				
Unn. Spring	34	NW4	7/13/73	Doty, Raymond	0.01	2.0	D	N
McClintock Spr.	34	SE4 NW4	8/17/62	McClintock, E.H.	0.6	150.0	I	Y
Unn. Spring	34	SE4 SW4	8/26/63	Firch, C.G.	0.03		D	Y

TABLE H-2 (Cont'd) Water-Right Claims on Springs in Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
				T. 3 N., R. 17 E.				
Unn. Spring	15	NW4 NE4	9/21/38	Brown, C.	0.01		D,S	Y
				T. 3 N., R. 18 E.				
Unn. Spring	8	SW4 SE4	10/14/58	Huot, L.	0.012		D,S	Y
Unn. Spring	16	Gov. Lot 1	10/14/58	Huot, L.	0.055	22.0	D	Y
				T. 4 N., R. 18 E.				
Unn. Spring	17	NW4 NW4	10/17/74	Holter Brothers	0.02	3.0	D,S	N
Unn. Spring	26	NE4 SE4	11/26/73	Imrie, Roscoe	0.02	5.4	D,S	N
Unn. Spring	26	NE4 SE4	11/26/73	Imrie, Roscoe	0.015	5.4	D,S	N
				T. 4 N., R. 19 E.				
Unn. Spring	7	Gov. Lot 1	10/19/64	Wilkins, Delbert	0.2	60.0	I	N
				T. 4 N., R. 20 E.				
Unn. Spring	7	NW4 NE4	4/14/71	Miller, Nina	0.004	2.0	D,S	N
Unn. Spring	7	NE4	4/14/72	Miller, Nina	0.01	1.0	S	N
Unn. Spring	14	NW4	4/14/71	Miller, Nina	0.015	1.0	S	N
				T. 5 N., R. 19 E.				
Unn. Spring	4	SE4	4/05/71	Long, S.H.		3.0	S	N
Unn. Spring	13	NW4 SW4	10/10/69	Powers, A.L.	0.01	0.5	S	Y
Unn. Spring	14	SW4 NW4	10/10/69	Powers, A.L.	0.01	0.5	S	Y
Unn. Spring	26	NE4 NW4	10/10/69	Powers, H.C.	0.005	0.5	S	Y

TABLE H-2 (Cont'd) Water-Right Claims on Springs in Klickitat County, Washington

Source	Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
				T. 5 N., R. 20 E.				
Knapp Spring	2	NW4 SE4	2/09/70	Jensen, J.A.	0.01	1.0	S	Y
				T. 6 N., R. 20 E.				
Unn. Spring	25	NW4 NW4	2/09/70	Jensen, J.A.	0.01	1.0	S	Y

TABLE H-3 Water-Right Claims on Ground Water in Klickitat County Washington

Section	Location	Priority	Name	Quantity Instan-taneous (CFS)	Quantity Annual (Acre feet)	Use	Certifi-cation
			T. 3 N., R. 10 E.				
12	E2	12/18/67	Henderson, C.V.	450.00	200.0	I	N
13	SE4	8/22/73	Wedrick, Laurence	8.0	2.0	D	N
13	NE4 SE4	9/22/61	Wedrick, M.S.	30.0	9.6	I,D	Y
13	SW4 SW4	6/26/68	Moore, A.F.	20.0	6.0	D,I	Y
			T. 3 N., R. 11 E.				
3	Gov. Lot 4	6/08/73	Walker, Melvin	7.5	2.0	D,S	N
5	SE4 SW4	6/30/74	Heany, Alvin	13.0	6.0	D,I	N
7	SE4 SW4	1/11/72	T & H Orchards	40.0	30.5	D,I	N
7	SW4 NE4	4/04/73	Spring, John	37.5	33.0	D,S,I	N
8	NE4 NW4	3/12/74	Yarnell, Lenard	10.0	2.0	D	N
8	NE4 NW4	8/01/74	Barrett, Thomas	10.0	8.0	I,D,S,	N
8	SE4 NW4	6/02/75	Peoples, Dennis	189.0	61.0	D,I	N
8	NW4 NW4	7/01/75	Calkins, Jess	150.0	62.0	D,I	N
10	NW4 NW4	3/13/67	Tetreault, R.B.	10.0	8.0	I,D	Y
10	SW4 SE4	10/07/70	Gilmer, D.L.	7.0	2.0	D	Y
10	SE4	10/24/74	Heany, Alvin	1200.0		I	N
11	SE4 SW4	11/08/74	Clack, Richard	15.0	14.0	D,I	N
15	NE4 NE4	4/24/72	Burris, Amel	11.0	1.0	D	N
15	NE4 NE4	9/26/75	Gadway, Charles	30.0		D,S,I	N
18	SE4 NW4	9/12/68	Klickitat Co. Cemetery	40.0	20.0	I	N
18	SW4 NE4	5/28/71	LaFollette, John	15.0	1.0	D	N
18	NE4 SW4	8/18/70	Prine, Jack	5.0	2.0	D	N
18	SE4 NW4	8/16/67	Yarnell, Merlin	110.0	82.0	D,I	N
18	NE4 SW4	4/30/73	Pearce, Clyde	10.0	2.0	D	N
18	SE4 NW4	6/10/64	Klickitat Co. Cemetery	20.0	16.0	I	Y
18	NE4 NW4	11/25/69	Larsen, H.B.	150.0	100.0	I	N
18	NE4 SW4	11/12/74	Simmons, William	150.0	44.0	D,I	N

TABLE H-3 (Cont'd) Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity Instantaneous (CFS)	Quantity Annual (Acre feet)	Use	Certification
23	NW4 SW4	8/14/61	Stauch, M.E.	10.0	5.6	D	Y
26	SW4	6/07/74	Warren, Thomas	50.0	59.0	D,I	N
29	SW4 NW4	5/06/70	City of Bingen	50.0	80.0	P	N
29		7/20/70	City of Bingen	130.0	185.0	P	N
30	E2 NE4	9/17/73	SDS Lbr. Co. & City	475.0	412.0	P	N
30	Gov. Lot 4	9/19/55	Underwood Fruit Co.	500.0	800.0	D,N	Y
30		5/06/70	City of Bingen	300.0	185.0	P	N
			T. 3 N., R. 12 E.				
28	SE4 SW4	11/19/68	Cole, E.E.	20.0	12.0	D,I,S	N
32	Gov. Lot 4	4/07/67	Washington State Highway Department	15.0	1.0	D	Y
32	Gov. Lot 4	9/01/67	Washington State Highway Department	20.0	1.0	D	Y
			T. 4 N., R. 10 E.				
11	SE4 NE4	9/11/67	Krall, N.E.	20.0	5.0	D I	Y
11	NE4 NE4	8/08/68	Hale, O.G.	18.0	6.0	I,D	Y
11	NE4 SE4	8/09/68	Baugher, F.L.	15.0	3.0	D,I	Y
11	NE4 SE4	6/12/70	Belding, C.F.	24.0	2.5	D,I	Y
11	SE4 NE4	7/12/71	Ransier, Fred	20.0		D,I	N
11	SE4 NE4	7/12/71	Ransier & Rogers	20.0	4.8	D,I	Y
13	SE4 NW4	9/04/73	Morris, Eugene	10.0	2.0	D	N
13	SW4 SE4	10/08/48	Moore, A.F.	17.0	8.0	I	Y
13	SW4 SE4	7/03/56	Moore, A.F.	50.0	28.0	I	Y
13	SE4 NW4	4/15/69	Robbins, J.E.	10.0	2.0	D	Y
25	SE4	2/19/74	Olson, Luther	20.0		D	N
36	SE4 NW4	9/25/72	Baker, George	5.0		D	N

TABLE H-3 (Cont'd) Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
			T. 4 N., R. 11 E.				
5	SW4 NW4	9/08/72	Riggleman, Kenneth	10.0		D	N
24	NW4 NE4	7/28/75	Smith, Kevin	4.0	6.0	D,S,I	N
30	SE4 NW4	6/27/75	Anderson, F.J.	17.0	6.0	D,I,S	N
34	SE4 NW4	4/15/69	Joslin, I.H.	30.0	15.0	D,I	Y
35	SW4 SW4	5/13/74	Austin, Mary	10.0	6.0	D,S,I	N
			T. 5 N., R. 11 E.				
31	SE4 SE4	10/18/63	Mt. Adams Orchard Co.	100.0	25.6	D,I,N	Y
32	SW4 SW4	9/18/47	Hopp-DeWilde Mill Co.	50.0	30.0	N	Y
			T. 6 N., R. 10 E.				
25	NW4 SW4	4/28/76	Woodruff, George	25.0		D	N
			T. 2 N., R. 12 E.				
3	NE4	3/14/29	SP&S Railway Co.	300.0	111.0	N,D	Y
3		2/11/55	Lyle Water Co.	500.0	224.0	P	Y
			T. 2 N., R. 13 E.				
6	Gov. Lot 4	8/08/72	Henderson, Dayton	20.0	11.4	I	N
16	NE4 SW4	4/21/71	Jones, Ivor	30.0	2.0	D	N
16	NE4 SW4	5/11/70	Odom, Cecil	15.0	4.5	D	N
16	NE4 SW4	9/06/72	Knowles, Robert	17.0	7.7	D,I	N
16	SE4 SW4	11/25/52	Dean, S.L.	15.0	8.0	I,D	Y
16		2/13/53	Murdock, O.C.	25.0	40.0	D	Y

TABLE H-3 (Cont'd) Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity Instan-taneous (CFS)	Quantity Annual (Acre feet)	Use	Certifi-cation
16	NE4 SW4	2/04/71	McKinnon, G.M.	24.0	14.0	D,I	N
21	SE4 SE4	4/02/70	Graves, D.E.	40.0	27.0	D,I	N
21	SE4 SE4	6/29/73	Graves, D.E.	80.0	26.0	I	N
22	SE4 NW4	2/14/73	Smith, Kent	500.0	208.0	I,S	N
22	SE4 SW4	10/15/70	Smith, Fred	600.0	450.0	N	N
25	SW4 SW4	3/23/70	Klickitat County Port D. #1	450.0	300.0	D,N	N
26	NE4 SE4	10/18/74	Klickitat County Port D. #1	1000.0	300.0	D	N
27	NW4 NE4	12/17/70	Jarl, Norman	900.0	517.0	N	N
27	NW4 NE4	2/17/53	Tidyman, L.C.	900.0	480.0	I	Y
28		3/20/53	Toda, F.	150.0	60.0	I	Y
28		5/28/53	Sisson, O.	25.0	22.4	D	Y
28		3/06/61	Ogawa, A.	80.0	37.6	D,I	Y
28		5/07/63	Williams, T.	60.0	46.8	D	Y
28		4/24/63	Odom, C.L.	12.0	8.1	D	Y
34		9/18/53	Dalles City	615.0	750.0	D,I	Y
34	NW4	7/05/74	Dallesport Development Company	105.0	41.0	D	N
			T. 2 N., R. 14 E.				
19	SE4 NW4	4/06/61	U.S. Corps of Engineers	190.0	41.6	D,I	Y
			T. 2 N., R. 15 E.				
7	SW4 SW4	3/08/68	Coffield & Sons	135.0	144.0	I,D	Y
17	Gov. Lot 4	10/01/27	SP&S Railway Company	750.0	10.0	D,N	Y
17	Gov. Lot 4	8/16/30	SP&S Railway Company	750.0	516.0	D,N	Y

TABLE H-3 (Cont'd) Water Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity Instantaneous (CFS)	Quantity Annual (Acre feet)	Use	Certification
			T. 2 N., R. 16 E.				
3	NW4 NW4	4/14/72	Gunkel, George	10.0	1.0	D	N
3	SW4 NW4	9/26/74	Niblack, James	20.0	7.0	I	N
3	SW4 NW4	9/26/74	Niblack, James	10.0	6.0	D,I	N
4	NE4 NE4	12/14/71	Ritter, Leland	150.0	34.1	I	N
4		4/06/60	U.S. Corps of Engineers	60.0	96.0	I,D	Y
4	SE4 NW4	4/30/69	Howe, J.W.	40.0	11.0	I	Y
4		2/17/71	Coffey, W.	10.0	4.0	D	N
4	NW4 NW4	8/05/74	Gore, Earl	20.0	10.4	I,D	N
			T. 3 N., R. 12 E.				
2	E2 NE4	6/10/74	Schwagerl, R.A.	50.0	42.0	D,I	N
1	E2 SE4	11/06/69	Schwagerl, R.A.	100.0	110.0	I,S,D	N
3		5/11/76	Shannon, Donald	35.0		S,D,I	N
15	SW4 NE4	3/21/74	Keyes, Francis	12.0	3.0	D,S	N
21	SE4 NE4	10/09/73	Wegner, Edward	9.0	10.6	D,I	N
21	NW4 NE4	9/17/75	Player, Thomas	40.0		D,I	N
27	SW4 SW4	10/06/60	Hanson, N.	20.0	9.6	D,I	Y
27	SW4 SW4	11/21/67	Waterman, L.	6.0	2.0	D	Y
27	SE4 SW4	9/16/74	Brubaker, James	10.0	2.0	D	N
28	SW4 SE4	2/25/74	Mahaffey, Lawrence	12.0	11.6	D,I	N
33	NE4 NE4	5/03/73	Crosby, Melvin	125.0	34.3	I	N
			T. 3 N., R. 13 E.				
19	NE4 SW4	8/13/75	Urban, Frances	20.0		D,S,I	N
24	SE4 SE4	1/23/74	Fleischauer, Paul	220.0	31.0	D,I	N
31	Gov. Lot 2	9/11/72	Palmer, Clara	15.0	2.0	D	N
31	SW4 SW4	9/20/73	Woods, Edward	10.0	2.0	D	N

TABLE H-3 (Cont'd) Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
			T. 3 N., R. 14 E.				
2	NW4 NE4	2/19/71	Humphrey, G.R.	2000.0	667.0	D,I	N
12	NE4 SE4	7/08/ 68	Fahlenkamp, V.	100.0	52.0	I,D	Y
			T. 3 N., R. 15 E.				
1	SE4 SE4	3/17/61	Linden, C.G.	75.0	60.0	D,I	Y
5	NE4 NE4	8/06/74	Eshelman, Charles	3.5	2.0	S	N
8	SE4 SE4	11/16/73	Isaacson	200.0	87.8	D,I	N
12	SW4 SE4	8/17/66	Basse, E.S.	360.0	320.0	I	Y
13	NW4 NE4	7/25/66	Basse, E.S.	200.0	186.0	I	Y
13	NW4 NE4	4/26/68	Basse, E.S.	500.0	400.0	I	Y
14	NW4 NE4	7/12/72	Hansen, Tim	50.0	23.0	D,S,I	N
15	SE4 SE4	7/15/75	Holthusen, Larry	2500.0	999.0	I	N
19	NE4 SE4	6/06/66	Smith, G.F.	190.0	240.0	I	Y
20	NE4 SW4	10/17/68	Jaekel, Quentin	375.0	197.5	I	N
20	NE4 SW4	7/18/67	Jaekel, Quentin	200.0	158.0	I	Y
21	NW4 NE4	9/28/49	Woods, L.	125.0	40.0	I	Y
22	SE4 NE4	4/25/73	Washington Dept. Natural Resources	440.0	161.0	I	N
22	SE4 NE4	5/22/61	Centerville Grange 81	40.0	16.0	I	Y
22	NE4 NE4	2/11/69	Washington Dept. Natural Resources	1100.0	358.0	I	N
22	SE4 NE4	12/18/75	Holthusen, Larry	800.0		I	N
28	NW4 SW4	5/07/70	Garner & Garner	170.0	114.0	I	Y
28	E2 SW4	3/22/71	Garner, W.	800.0	266.0	I	N
29	SW4 NE4	8/11/69	Washington Dept. Natural Resources	3150.0	1050.0	I	N

TABLE H-3 (Cont'd) Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity Instantaneous (CFS)	Quantity Annual (Acre feet)	Use	Certification
			T. 3 N., R. 16 E.				
1	NE4 NW4	5/22/74	Charles, William	60.0	16.0	D,I	N
3	NW4 SE4	5/25/74	Troutman, Richard	500.0	231.0	I,D	N
3	NE4 SW4	6/30/74	Campbell, Marion	60.0	29.0	D,S,I	N
7	SW4 SE4	10/29/68	Basse, E.	300.0	175.0	I	N
7	SE4 SW4	5/10/72	Basse, E.	750.0	667.0	I	N
8	NW4 SE4	9/06/67	Linden, F.	370.0	313.3	I	Y
8	NW4 SE4	7/19/68	Linden, F.	560.0	485.0	I	Y
18	NW4	3/07/72	Linden, Calvin	1300.0	733.0	I	N
18	NW4 NW4	7/05/66	Eshelman, L.J.	100.0	80.0	I	Y
			T. 3 N., R. 17 E.				
5	SE4 SW4	3/04/63	McDowell, E.E.	225.0	180.0	I	Y
5	Gov. Lot 2	7/05/68	McDowell, E.E.	1420.0	600.0	I	Y
20	E2 SW4	2/02/59	Holden, G.R.	150.0	240.0	D	N
29	NE4 NE4	8/29/60	U.S. Corps of Engineers	600.0	960.0	D,N	Y
			T. 4 N., R. 12 E.				
26	SE4 NE4	2/27/53	Lane, G.	40.0	27.0	I	Y
26	NE4	4/19/76	Beck, Arthur	1000.0		S,I	N
			T. 4 N., R. 13 E.				
2	E2 SW4	6/28/74	Woodruff Bros.	70.0	18.0	I,D	N
28	E2	8/22/73	Hart, Howard	13.0	2.0	D	N
28	NE4 SE4	7/19/66	Petre, R.A.	22.0	7.0	D,I	Y

TABLE H-3 (Cont'd) Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity Instantaneous (CFS)	Quantity Annual (Acre feet)	Use	Certification
			T. 4 N., R. 14 E.				
1	NW4 SW4	10/09/74	Sipe, Kenneth	25.0	7.0	D,S	N
			T. 4 N., R. 15 E.				
1	SW4 SE4	5/13/70	Amidon, E.H.	960.0	785.0	I	N
1	NW4 NE4	7/16/75	Thiele, Dale	1000.0		I	N
2	NE4 SW4	5/23/55	Williams & Stegman	110.0	80.0	I	Y
2	SW4 SW4	8/14/67	Spalding, Daryl	250.0	122.0	I,D	Y
2	SW4 SW4	00/00/40	Spalding, Daryl	9.0	1.0	D	N
2	SE4 SW4	00/00/32	Adams, Christian	9.0	1.0	D	N
2	SE4 NW4	00/00/16	McPhersom, M.J.	9.0	1.0	D,S	N
3	E2	8/24/67	Wishram Land Co.	1350.0	1004.0	D,I	N
3	NW4 SE4	00/00/44	Wishram Land Co.	9.0	1.0	D	N
4	SE4 SW4	3/18/68	Riches, P.M.	15.0	14.0	D,I	Y
4	SE4 SW4	11/12/71	Shultz, Herman	310.0	102.0	D,I	N
4	NE4 SW4	5/23/55	Spalding, Daryl	180.0	68.4	I	N
4	SE4 SW4	00/00/65	Riches, Phillip	9.0	1.0	I	N
5	NE4 NW4	10/13/71	Counts, Mike	1200.0	441.0	D,I	N
5	NW4 NW4	2/20/74	Bratton, Howard	800.0	397.0	I,D	N
5	NE4 SE4	10/04/67	Thiele, D.	400.0	360.0	D,I	Y
5	NE4 NE4	3/25/69	Thiele, D.	750.0	527.0	D,I	Y
5	NE4 SE4	7/16/75	Thiele, Dale	600.0	267.0	I	N
5	NE4 NE4	7/16/75	Thiele, Dale	600.0		D,I	N
8	SE4 SE4	00/00/26	L. Kaiser Estate	9.0	1.14	D,S	N
9	NE4 NW4	4/16/71	Hill, Raymond	750.0	233.0	I	N
9	SW4 SE4	00/00/25	Woodward, John	18.0	2.0	D	N
9	SW4	00/00/09	Gillenwaters, Dean	30.0	9.8	N	N
9	SE4 SE4	00/00/64	Gillenwaters, Dean	153.0	58.14	I	N
9	SE4 NW4	00/00/55	Hill, Raymond	9.0	1.0	D	N

TABLE H-3 (Cont'd) Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity Instan-taneous (CFS)	Quantity Annual (Acre feet)	Use	Certifi-cation
9	NE4 SE4	00/00/54	Woodward/Lane	9.0	1.0	D	N
9	SE4 NE4	00/00/61	Ihrig, Robert	9.0	1.0	D	N
9	SW4 SE4	00/00/55	Riley, James	9.0	1.0	D	N
9	SE4 SE4	00/00/58	Imrie, Robert	9.0	1.0	D	N
9	SE4 SW4	00/00/46	Bellamy, Paul	9.0	1.0	D	N
10	NE4 NW4	10/30/72	Hutton, R.F.	750.0	248.0	I	N
10	NW4 SE4	9/19/67	Ruff, R.E.	300.0	142.0	D,I	Y
10	SE4 NW4	3/25/68	Beebe, G.L.	450.0	375.0	I	N
10	NE4 NW4	00/00/33	Ihrig, Robert	9.0	1.0	D	N
10	SW4 NW4	5/00/56	Beebe, George	9.0	1.0	D	N
10	NE4 NW4	00/00/1880	Hutton, Robert	9.0	1.0	D	N
11	NE4 NW4	00/00/46	Lefever, Charles	9.0	1.0	D	N
15	SW4 NE4	5/06/74	Wilkins, Ross	15.0	3.0	D	N
16	SE4 NW4	2/11/69	Washington Dept. Natural Resources	2000.0	700.0	I	N
16	NW4 SW4	00/00/08	Washington Dept. Natural Resources	9.0	1.0	D	N
16	NE4 NW4	00/00/26	McGrew, Richard	9.0	1.0	D	N
16	NE4 NW4	00/00/44	Bellamy, Paul	9.0	1.0	D	N
17	N2 NE4	12/08/75	McGrew, Richard	800.0		S,I	N
17	SE4 NW4	00/00/40	Hornibrook, R.E.	9.0	1.0	D	N
17	NE4 SE4	00/00/46	Bellamy, Paul	9.0	1.0	D	N
20	NE4 NE4	00/00/25	Tupper, C.L.	9.0	1.0	D	N
23	SW4 NW4	5/12/69	Dunn, B.F.	1175.0	749.0	I,D	Y
24	NW4 NW4	6/18/74	Tobin, Lyle	1680.0		I,D	N
26	SE4 NE4	7/19/71	Keech, George	250.0	183.0	I	N
26	SE4 SE4	5/20/68	Keech, George	250.0	150.0	I	N
26	NE4 SW4	00/00/01	Hinshaw, Geary	9.0	1.0	D	N
27	NE4 SE4	10/04/74	Alexander, Michael	45.0	35.0	I,D	N
32	SE4 SE4	8/06/74	Eshelman, Charles	10.0	3.0	D,S	N

TABLE H-3 (Cont'd) Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity Instan-taneous (CFS)	Quantity Annual (Acre feet)	Use	Certifi-cation
			T. 4 N., R. 16 E.				
1	NE4 SW4	4/03/72	Wirick, Dale	25.0	18.0	D,I	N
2	SW4 NE4	6/24/68	Schroder, F.H.	160.0	38.5	S,I	N
2	W2 NW4	12/16/70	Van Aelst, Edward	3000.0	1000.0	I	N
5	SW4 SW4	2/20/73	Wright, George	45.0	30.6	D,I	N
6	NE4 NE4	4/18/74	Pond, Roger	10.0	10.0	D,I	N
6	NE4 NE4	9/04/75	Boardman, Roger	28.0	25.0	D,S,I	N
8	SW4 NE4	8/06/69	McEwen, C.F.	60.0	18.0	D,I	Y
9	N2 NW4	10/04/73	Foster, E.M.	150.0	59.3	D,I	N
10	NW4 NE4	10/08/71	Firch, Maxine	35.0	5.9	D,I	N
10	SW4 SW4	6/12/69	Rose, Jack	60.0	52.0	D,I	N
10	N2	2/01/60	Sellers, R.H.	55.0	20.0	I	Y
11	NE4 SE4	1/13/72	Reimer, Doris	60.0	72.3	D,I	N
11	NW4 NW4	12/19/73	Barrett, C.M.	725.0	414.5	I	N
11	NW4 NW4	11/12/64	Barrett, C.M.	150.0	60.0	I	Y
11	NW4 NW4	3/31/70	Barrett, C.M.	1400.0	571.0	I	N
11	SW4 SW4	6/28/74	Barrett, C.M.	40.0	20.0	D,S	N
14	SW4 NE4 NE4 SW4	10/22/68	Norris, M.H.	90.0	64.5	I,D	Y
15	SW4 SW4	6/16/69	L.G. Norris Estate	60.0	1.0	D,S	N
15	SW4 SW4	11/08/74	7th Day Adventist Church	45.0	11.0	D,I	N
15	SW4 SE4	10/01/75	McConnell, Darel	10.0	2.0	D	N
16	SE4 SE4	8/26/71	Ledbetter, D.B.	140.0	40.6	D,N,I	N
16	SW4 SE4	3/29/72	City of Goldendale	1400.0	784.0	P	N
16	SW4 SE4	5/27/69	Stone, F.P.	45.0	10.0	I	Y
16	NE4 SW4	4/23/74	Williams, Donald	20.0	6.0	D,I	N
16	SW4 SW4	9/12/74	Ingraham, Raymond	20.0	5.0	D,S,I	N
16	SW4 NW4	11/14/75	Mt. View Cemetery	300.0		D,I	N
17	SE4 NE4	9/16/71	Thompson, Neal	180.0	23.9	D,I	N
17	SE4	00/00/10	Brock, G.G.	50.0	32.0	I	Y

TABLE H-3 (Cont'd) Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity Instantaneous (CFS)	Quantity Annual (Acre feet)	Use	Certification
17	NE4 NW4	10/10/67	Lefever, J.L.	350.0	257.0	I	Y
17	SE4 SE4	8/26/70	Freer, H.W.	60.0	4.0	D,I	Y
17	SE4 NE4	10/09/74	Sipe, Kenneth	12.0	2.0	D	N
17	NW4 SE4	5/07/75	Casebolt, Donald	25.0	2.0	D	N
17	SE4 NE4	4/05/76	Templer, Dennis	70.0		D,I	N
18	SE4 SW4	11/30/71	O'Leary Well Drilling	100.0	23.0	D,N,I,P	N
19	SE4 SE4	5/25/70	Holy Trinity Church	50.0	6.0	I	Y
20	SE4 NW4	11/02/70	Stackhouse, James	60.0	26.0	I	N
20	NE4	7/26/72	Kerns, Eldon	10.0	1.0	D	N
20	NE4	3/28/73	Moore, Harry	5.0	4.0	D	N
20	NE4 NE4	7/15/46	Klickitat County	130.0	8.0	I	Y
20	NW4 SW4	9/17/59	Storkel, C.L.	90.0	72.0	I	Y
20	NE4	8/05/66	Layman Lumber Co.	75.0	30.0	N	Y
20	NE4 NW4	7/03/74	Hillman, Raymond	45.0	35.0	I	N
20	NW4 NW4	2/20/74	D.M. Layman, Inc.	60.0		D,N	N
21	SE4 NW4	2/12/53	Goldendale School Dist.	110.0	30.0	I	Y
21	NW4	7/30/69	Foster, J.D.	250.0	7.4	D,N	N
21	NW4 SE4	12/17/70	Mesecher, Charles	60.0	51.5	I	N
22	NE4 SE4	3/20/68	Gorge Contractors	650.0	200.0	I	N
22	SW4 SE4	4/19/68	Gorge Contractors	650.0	200.0	I	N
22	NE4 SW4	7/29/68	Gorge Contractors	600.0	300.0	I	N
26	NE4 NW4	4/19/68	Willis, G.	65.0	32.0	I,D	Y
27	SW4 NW4	9/04/68	Maurer, R.	3000.0	751.0	I,S	N
28	NW4 SW4	5/23/68	Herin, C.E.	410.0	132.0	D,I	N
28	NE4 NE4	8/08/68	Dingmon, D.	600.0	275.0	I	Y
29	S2 NE4	6/14/65	Hornibrook, R.E.	158.0	144.0	D,S,I	N
32	NE4 NE4	9/04/69	Blanchard, C.R.	100.0	61.0	D,I	N
33	W2 NW4	7/21/70	Smith, Howard	10.0	1.0	D	N
34	SE4 NE4	9/17/68	Norris, M.H.	320.0	252.0	I,D	Y
35	SE4 SE4	5/22/74	Young, W.C.	10.0	8.0	D,I	N
36	SE4 SE4	6/14/75	Thayer	100.0	68.0	D,I	N

TABLE H-3 (Cont'd) Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity Instantaneous (CFS)	Quantity Annual (Acre feet)	Use	Certification
36	SE4 SE4	4/04/75	Gleason, James	100.0	34.0	D,I	N
			T. 4 N., R. 17 E.				
7	SE4 NW4	5/14/68	Schroder, L.E.	2250.0	900.0	I	N
19	SW4 NE4	1/31/74	Fridley, Clyde	235.0	233.0	D,S,I	N
29	SE4 SW4	3/27/68	Willis, Sheryl	340.0	270.0	I	N
30	SE4 SE4	11/16/72	Willis, Sheryl	955.0	760.0	I	N
32	SE4 SW4	5/05/70	McDowell, Eva	700.0	655.0	D,I	N
			T. 5 N., R. 12 E.				
18	Gov. Lot 1	4/30/69	Perkins, J.R.	240.0	98.0	I	Y
18	Gov. Lot 2	4/30/69	Perkins, J.R.	350.0	114.0	I	Y
			T. 5 N., R. 13 E.				
1	Gov. Lot 3	2/01/54	J. Neils Lumber Co.	50.0	80.0	D,N	Y
			T. 5 N., R. 14 E.				
9	SE4 SE4	7/31/74	Boardman, H.L.	500.0	400.0	I	N
16	E2 NE4	4/28/67	Boardman, W.W.	100.0	81.0	S,I	N
16	NW4 SE4	7/31/74	Boardman, H.L.	320.0	162.0	I,D	N
22	NW4 SE4	1/06/71	McKinney, R.C.	12.0	10.0	D,I	N
25	SW4	9/25/74	Swift, William	1000.0	1600.0	I,S	N
36	SW4 SW4	5/12/71	Richardson, Theodore	500.0	169.0	D,I	N
36	NW4 NE4	6/28/74	Van Patter, Dwaine	1000.0		I,D	N
36	NW4 NE4	6/28/74	Van Patter, Dwaine	40.0		I,D	N
36	NW4	9/25/74	Swift, William	1000.0	1600.0	I	N

TABLE H-3 (Cont'd) Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity Instan-taneous (CFS)	Quantity Annual (Acre feet)	Use	Certifi-cation
			T. 5 N., R. 15 E.				
14	NW4 NW4	2/12/70	Hutton, Robert	15.0	5.0	D,S,I	N
15	SE4 SW4	10/24/50	Popenoe, J.W.	50.0	34.0	D,I	Y
19	SE4 SW4	1/20/60	Prescott, O.M.	380.0	157.6	D,I	N
19	SE4	10/02/63	Prescott, O.M.	1200.0	800.0	D,I	N
30	NE4 SE4	6/26/74	King, Ajah	15.0	4.0	D,I	N
31	SE4	6/07/74	Schilling, Paul	900.0	660.0	I	N
			T. 5 N., R. 16 E.				
22	SE4 SE4	2/17/67	Tyler, G.A.	50.0	32.0	D,I	N
25	SE4 SE4	11/20/69	Bise, R.L.	400.0	168.0	I,D	N
25	SW4	9/24/70	Brown, M.E.	600.0	193.0	I,D	N
25	SW4 SE4	4/30/74	Cuff, Thomas	50.0	30.0	D,S,I	N
27	SE4 SW4	5/31/74	Marshall, Homer	100.0	35.0	D,I	N
28	SE4 SE4	8/24/73	Miller, Ted	12.0	2.0	D	N
28	SW4 SE4	3/04/76	Wellman, Michael	30.0		D,I	N
31	NW4 SE4	8/03/71	Scheradella, Robin	60.0	1.0	D	N
34	NW4 NW4	5/07/73	Evans, Norman	50.0	44.9	D,I	N
35	NE4 SE4	6/14/74	Schroder, Russell	10.0	2.0	D	N
36	SW4 SW4	9/17/73	Young, William	300.0	73.5	D,I	N
			T. 5 N., R. 17 E.				
3	NE4 SW4	9/21/69	Washington Park & Re-creation Comm.	50.0	23.0	D	N
3	NE4 SW4	10/24/69	Washington Park & Re-creation Comm.	50.0	18.5	I	Y
3	SW4 SW4	4/13/70	Timmer, G.J.	80.0	3.0	D	N
3	SW4 SW4	12/08/71	Timmer, G.J.	80.0	33.0	D,I,N	N

TABLE H-3 (Cont'd) Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity Instantaneous (CFS)	Quantity Annual (Acre feet)	Use	Certification
14	NW4 SE4	9/22/75	Scott, Henry	100.0	28.0	D,I	N
32	W2 NW4	10/17/72	The Trans-West Co.	17.0	2.0	D	N
			T. 6 N., R. 12 E.				
10	NW4 SE4	4/27/67	School District #401	31.0	13.0	D,I	Y
16	SW4 NE4	6/21/66	Neils, G.F., Jr.	20.0	2.0	D	Y
27	N2 NW4	8/30/54	Zeigler, E.W.	300.0	180.0	D,I	Y
			T. 3 N., R. 17 E.				
2	Gov. Lot 3	5/22/73	Claussen, Glenn	70.0	65.0	D,I	N
12	SE4 SW4	12/09/65	U.S. Corps of Engineers	35.0	5.0	D	Y
20	SE4	3/18/69	Martin Marietta Co.	2000.0	3200.0	D,N	N
20	NW4 SE4	3/18/69	Martin Marietta Co.	900.0	144.0	N,D	N
			T. 3 N., R. 18 E.				
9	SW4 SW4	4/14/64	Hout, L.	40.0	64.0	D,I	Y
			T. 3 N., R. 19 E.				
8	SW4 SW4	1/09/73	Wesley, Alice	6.0	3.9	D,I	N
18		8/12/64	Wesley, Alice	27.5	30.0	D,I	Y
20	SW4 SE4	8/12/74	U.S. Corps of Engineers	425.0		D,I	N
			T. 3 N., R. 20 E.				
7	SE4 NW4	10/09/53	White, H.A.	250.0	140.0	I	Y
21	SW4 SE4	9/08/54	Sundale Orchards Inc.	100.0	10.0	D	Y
21	SW4 SE4	3/03/64	Sundale Orchards Inc.	800.0	320.0	I	N

TABLE H-3 (Cont'd) Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity: Instantaneous (CFS)	Quantity: Annual (Acre feet)	Use	Certification
21	SW4 SE4	2/14/75	Sundale Orchards Inc.	200.0		I	N
21	NE4 SW4	8/13/75	Sundale Orchards Inc.	2000.0		I	N
28	Gov. Lot 3	9/08/54	Sundale Orchards Inc.	1500.0	540.0	I	Y
			T. 3 N., R. 21 E.				
9	SW4 SW4	5/16/61	N. Roosevelt Water Assc.	40.5	50.0	P	Y
9	SW4 SW4	2/24/64	N. Roosevelt Water Assc.	98.0	37.8	P	Y
9	NE4 SW4	12/09/65	U.S. Corps of Engineers	60.0	5.0	D	Y
16	NW4 SW4	5/12/19	SP&S Railway Co.	200.0	111.0	N,D	Y
17	NE4	6/19/61	Reader, K.M.	180.0	112.0	D	Y
18	NE4 SE4	7/13/71	Goree, Norm	250.0	135.3	D,S,I	N
			T. 4 N., R. 17 E.				
9	W2	10/30/73	O'Leary Well Drilling	500.0	288.0	D,I	N
9	W2	10/30/73	O'Leary Well Drilling	500.0	288.0	D,I	N
9	W2	10/30/73	O'Leary Well Drilling	500.0	288.0	D,I	N
9	W2	10/30/73	O'Leary Well Drilling	500.0	288.0	D,I	N
9	W2	10/30/73	O'Leary Well Drilling	500.0	288.0	D,I	N
10	S2 SW4	8/03/73	O'Leary Well Drilling	300.0	116.0	D,I	N
15	NE4 SE4	10/07/75	Sanders, Francis	25.0		D,I	N
22	SW4 SW4	4/05/57	Fenton Brothers	50.0	20.0	D,I	Y
22	N2 NE4	9/22/75	Sanders, Francis	190.0		D,S,I	N
23	NW4 NW4	10/21/74	Dunn, Joe	1400.0	502.0	D,I	N
23	SE4 NW4	10/21/74	Dunn, Joe	140.0	502.0	I,D	N
			T. 4 N., R. 18 E.				
17	NW4 SE4	6/18/70	Schuster, C.V.	500.0	368.0	I	Y
29	SW4 NE4	1/24/68	Brack, R.R.	500.0	470.0	I	Y

TABLE H-3 (Cont'd) Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity Instan-taneous (CFS)	Quantity Annual (Acre feet)	Use	Certifi-cation
			T. 4 N., R. 20 E.				
3	NE4 SW4	7/11/68	Berk, Harland	1000.0	800.0	I	N
3	NE4 SW4	8/25/69	Berk, Harland	1500.0	1000.0	I	N
5	S2 SE4	6/30/69	Wilkins, B.	1600.0		I	N
6	Gov. Lot 1	10/10/69	Powers, A.L.	2.5	1.0	D,S	Y
20	SW4 SE4	3/22/74	G.B. Ranch	12.0	2.0	D,S,	N
			T. 5 N., R. 20 E.				
19	NW4	10/10/69	Powers, A.L.	4.5	1.0	D,S	Y
28	NW4 NE4	6/27/68	Berk Brothers Inc.	650.0	375.0	I	Y
			T. 5 N., R. 22 E.				
27	NE4 NE4	3/18/71	Matsen, A.M.	1200.0	1215.0	I	N
33	SE4	4/13/76	Rinta, John	2500.0		I	N
34	NE4 NW4	2/14/75	Miller, Melvin	1000.0	660.0	I	N
34	SE4	4/13/76	Rinta, John	2500.0		I	N
			T. 5 N., R. 23 E.				
3	NE4 NE4	12/04/72	Peterson, R.J.	3000.0		I	N
3	E2 NE4	9/28/55	Peterson, R.J.	200.0	160.0	I	Y
3	E2 SW4	12/12/56	Peterson, R.J.	90.0	40.0	I	Y
13	SW4	3/26/70	Bert Wilkins Logging	3500.0	2824.0	D,I	N
28	NW4	1/29/59	Mitchell, F.L.	1600.0	640.0	D,I	N
34	SE4 NE4	8/02/72	Mercer Ranches Inc.	5000.0		D,S,I	N

TABLE H-3 Water-Right Claims on Ground Water in Klickitat County, Washington

Section	Location	Priority	Name	Quantity Instantaneous (CFS)	Quantity Annual (Acre feet)	Use	Certification
			T. 6 N., R. 20 E.				
35	NW4 NE4	2/09/70	Jensen, J.A.	9.0	2.0	D,S	Y
			T. 6 N., R. 23 E.				
9	NW4 SE4	1/17/72	Andrews, Robert	3000.0		I	N
11	SW4 SE4	6/27/60	Smith, G.W.	200.0	160.0	D,I	Y
11	SE4	6/27/60	Smith, G.W.	400.0	320.0	I	Y
12	SW4 SE4	1/17/72	Andrews, Robert	12000.0		I	N
15	SE4 NE4	10/24/67	Smith, G.W.	600.0	720.0	I	Y
16	NE4	8/30/71	Washington Dept. Natural Resources	6300.0	2133.0	I	N
22	NE4 SE4	3/20/70	Smith & Andrews	2500.0	3333.0	I	N
22	NE4 SE4	4/01/71	Andrews, Robert	2400.0	2561.0	I,D	N
36	NE4	8/30/71	Washington Dept. Natural Resources	6300.0		D,S,I	N